the OIL AND GAS JOURNAL
PUBLISHED WEEKLY DECEMBER 12, 1960

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Statistics p. 178

Young liberal to take top U. S. oil post

Rep. Stewart Udall, 40, next Interior Secretary, is no zealous idealist, but voted against gas bill, and is not familiar with oil. A lot of policy matters affecting oil men await his review ▸ 75

U. S. may ease credit to help foreign sales

Decline in sales of U. S. equipment might be reversed with changes in credit policies, manufacturers tell sympathetic government men ▸ 78

New toll roads lure marketers

Five states have pay-road projects in the works. Spirited bidding is expected on the expensive prestige locations ▸ 80

Aluminum drill pipe passes first test

But not until the string is completely worn out can cost per foot be computed and comparison made with steel pipe ▸ 102

Greetings

from **Halliburton**

COMPANY . DUNCAN, OKLAHOMA

OIL AND GAS JOURNAL
Vol. 58, No. 50

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TECHNOLOGY—OPERATION

Drilling-Production

Aluminum Drill Pipe Passes First Test 102

By Ed McGee

First commercial string has dug its first well in drilling a 10,000-ft.-plus hole for Shell in the Yorktown area of South Texas. While the test is significant, all concerned with it emphasize that it isn't conclusive. Only after the string is completely worn out can they compute its cost per foot of hole drilled.

What Operators Learned From Competitive Pumping Tests 105

Two major producing companies have evaluated the Mark II unit pumper in head-to-head comparison tests. Preliminary conclusions are that the new unit may be a step in the cost-cutting direction and that the unit produces the same or more oil with a smaller prime mover.

Rangely Flood Moves Ahead 110

By W. B. Bleakley

The 19,000-acre Rangely field water flood is now producing 44,000 bbl. daily. Gas production is 125,000 M.c.f. per day with 90,000 being injected. Water-injection rate is about 85,000 bbl. daily. The Rangely field gasoline plant is now operating with remote absorbers.

Don't Let Fuzzy Thinking Foul Up Rig Hydraulics 130

By Preston L. Moore

Jet bits go hand in hand with a carefully planned hydraulics program. Here are pointers to be considered in the development of such a program. Part 7 in the series on drilling costs.

Oil-Well Pumping—26 134

By Joseph Zaba

Some factors that affect efficiency of sucker-rod pumps.

Pipelining

Shell Keeps Close Check on Controllable Costs 125

By Adin H. Hall

This is a function of the operating-services department. Here are an organization chart for this department, how this department functions, and how it deals with costs.

Refining-Processing

How A Computer is Helping Delhi-Taylor 117

By George Hanson

The Burroughs 205 computer at Delhi-Taylor's Corpus Christi, Tex., refinery is used for refinery accounting, gasoline blending, sales forecasting, process engineering and design, and for computing refinery earnings.

Process Costimating—85 119

Plant costs and chemical prices for light-oil treating.

How Phillips Treats Waste Water at Okmulgee 132

By Kenneth W. Brooks

With comparatively small investment, with units which require very little operator time, and with equipment which occupies little space, Phillips Petroleum Co. has licked many of the problems of waste disposal at its Okmulgee, Okla., refinery. And it has cut water consumption about 8%.

New Petrochemical Plant on Stream 137

By H. C. Bozeman

First phase of revamping and construction has been completed by Jefferson Chemical Co., Inc., at its Conroe, Tex., plant bought from Gulf Oil Corp. in early 1960.

General

Supervisor Rating Boosts Efficiency 112

By P. W. Maloney and P. J. Patinka

"Rate your supervisor" is a self-help program to improve supervisory efficiency that Esso Research & Engineering Co. has proved to be effective.

the OIL AND GAS JOURNAL Newsletter

Tulsa, Okla.
Dec. 12, 1960

Idea of crude quotas for each state has been abandoned:

Interstate Oil Compact Commission instead will continue a study of market-demand proration to determine its usefulness as a conservation tool in all states.

Compact 2 years ago created special committee whose aim was to equalize production by assigning a fair share of the market to each state. It was an effort to keep a lid on production in the Rocky Mountain and Great Lakes areas (p. 93)*.

Greatest dangers to proper conservation, according to Texas Gov. Price Daniel, are:

...Increase of imports at faster rate than domestic production.

...Federal regulation of gas at low prices thus giving oil unrealistic competition.

...Failure of some states to prorate oil production in line with demand.

He told Compact these three trends are depressing crude markets, contributing to premature abandonment of stripper reserves, and discouraging exploration and drilling.

Other compact highlights:

...Regulation of natural gas producers is no longer needed, says FPC Commissioner Arthur Kline. Competition now would take care of proper pricing.

...Arizona has a working conservation commission with a healthy climate for the oil business—it now needs some oil wells.

...Water-flood proration in New Mexico has been achieved at no cost to primary production or the search for new reserves.

▼ ▼ ▼

Interesting struggle is shaping up on an LPG pipeline from Texas to serve the southeastern market.

Just as Trans-Southern prepared to start its line from

---

*Refers to article in this issue giving more details. When no page is given, the item is a Newsletter exclusive.

Houston to Danville, Va., a group of big shippers announced its interest in a rival line to serve the same area. Shippers interested are Warren Petroleum, Phillips Petroleum, Union Texas Natural Gas, and Tuloma Gas Products (p. 82).

The shipper group contains the leading marketers and producers of LPG, and their business would be vital to success of the Trans-Southern line. But Trans-Southern plans to go ahead despite consensus that only one line is feasible.

Pipeline Notes: First move on Texas-Mexico-California gas pipeline has been made by Tennessee Gas and Southern California Edison. They seek approval on California segment of 1,600-mile line (p. 96)...Expansion of Texas-to-Florida gas line already is being planned by Houston Corp. plus construction of an extraction plant near Jacksonville.

▼ ▼ ▼

Idea of an Edmonton-Montreal crude line has been abandoned by some Canadian independent oil men—at least for present.

President A. G. Bailey of the Independent Canadian Petroleum Producers Association recommends first a voluntary plan giving Canadian companies responsibility for increased use of domestic crude.

But other independents, obviously at variance with Bailey's policy statement, continue to push for the pipeline seeking to supplant imports with western crude in Montreal.

Domestic Canadian crude, meanwhile, is gaining more of the home market. It will account for 58% of total refinery receipts in January compared with 53% in September.

Shell has cut back 2 cents of the 3-cent per barrel price increase it posted on Saskatchewan crude last month. Other purchasers refused to go along with the full raise. New postings: Midale A $1.79; Midale C $1.69; Weyburn $1.78; and West Kingsford $1.79.

▼ ▼ ▼

Oil and gas lawyers complain more frequently now that the work load on their staffs is staggering.

Legal departments are nearly swamped by the increase in exploration-production problems, gas work, and marketing cases. There also apparently is a shortage of local attorneys with training and experience sufficient to handle assigned cases on a fee basis.

Reasons cited for the growing work load: New load of FPC cases since the Phillips gas decision; more intricate conservation work before state and federal agencies now handled by the legal staff instead of operating men; and lease plays involving Indian lands and offshore tracts mean a maze of legal work.

The cure: Some companies are realigning their legal staffs into special groups using new attorneys under guidance

of a veteran. Attorneys also advocate that non-legal personnel be trained to handle routine conservation matters and that state agencies handle more regulatory matters administratively rather than by formal hearing.

▼ ▼ ▼

Growth of U. S. refining capacity is nearly stalled.

Projects now on the drawing boards will increase capacity by only 48,800 bbl. daily by the third quarter of 1961. This lags considerably the 169,900-bbl. increase posted between September 1959 and September 1960 (p. 86).

Capacity now stands at 9,890,050 bbl. daily, will rise to 9,922,350 by year's end, and reach 9,948,850 bbl. daily by the fourth quarter of 1961.

Major findings from Atlantic Refining work in designing fuels for high-compression cars:

...Important factors in determining fuel requirements are full and part throttle knock, deposit ignition, and spark-plug life. With present knowledge these requirements may be met for the 12:1 compression ratio level but not 15:1.

...Fuel possibilities at 12:1 compression ratio include typical leaded commercial fuels of 102 Research and 95 Motor with 0.5-0.8 theories of phosphorus; metal-free fuels of similar octane quality; volatile paraffinic fuel with lead and no phosphorus at similar octane levels.

...Important qualities in compounding fuels for high-compression engines are octane ratings and deposit-forming characteristics and not surface ignition resistance.

...Spark-plug life may lessen as compression ratios go up even with phosphorus fuels.

▼ ▼ ▼

Compact cars used by oil companies in part-interest operations won't have a separate rate schedule in 1961, the Petroleum Motor Transport Association has decided.

Reason: Short experience records on operating expense and maintenance. Some companies also still are experimenting to determine worthiness of compacts as field cars.

PMTA draws up a rate schedule which is used to determine credits for equipment used in joint ventures. On passenger equipment, it suggests 6 cents per mile on the lighter cars and 7 cents for others.

Move to relax credit rules on export sales of oil-field equipment may result from Washington conference of domestic manufacturers and Commerce Department officials.

Supply and service firms contend present rules are big barrier to their getting overseas business. They can't get credit now for sales to countries which have a government oil monopoly. And rule applies only to oil-field equipment.

Commerce officials indicate they will work with Export-Import Bank to change the credit restrictions (p. 78).

Market Memo

Dec. 12, 1960

Posted prices are waiting for the other shoe to fall.

The fact that postings are firm on the Gulf Coast doesn't reflect the true condition. The market is inactive with no inquiries and no spot sales to relieve the oversupply.

Explanation for the paradox is this: Postings are based on reported spot sales or refiners' quotations. But the big volume of products move from seller to buyer under contract at prices generally below prevailing postings.

Thus, an oversupplied market where there is no spot trading or changes in refinery quotations will produce few changes in posted prices.

Another factor is present on the Gulf Coast. Refiners are reluctant to discuss price discounts that might move some of their gasoline for fear that wage increases soon may increase their costs. If they cut prices now, they probably can't get them up later, and profits will get a double blow.

Until a spot sale is made and reported or a firm quotation to sell at a price different from current postings, gasoline on the Gulf Coast will be posted on a July price basis. Middle distillate prices still await the test of winter demand.

Prices, meanwhile, are: 11.25 cents for 92-RON gasoline, and 8.25 for No. 2 fuel.

In Chicago, posted price increases of one-quarter cent per gallon on No. 1 and No. 2 have failed to eliminate discounts. Postings now stand at 10.5 cents for No. 1 and 9.75 for No. 2. Refiners are hoping colder weather will put firmer base under these prices. Gasoline posted at 12.625 cents for 92-RON is discounted from one-quarter to three-eighths cent.

On the river, refiners with middle distillates available at water terminals are getting inquiries from Chicago wholesalers but aren't trading. Buyers are seeking products at three-eighths to one-half cent off Gulf Coast lows. They are volume buyers looking for Christmas bargains. Normal price basis for No. 1 and No. 2 during the heating oil season is one-quarter to three-eighths cent over Gulf Coast postings.

Group 3 gasoline for northern shipment, posted at 12.5 cents for 91-RON, is in fair shape. Discounts of three-eighths to one-half cent are from limited sources. No. 1 and No. 2, posted at 10 and 9 cents respectively, are firm and subject to no discounting.

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True economy in bringing a barrel of oil to the surface calls for quality equipment . . . and that means quality right down to the roller bearings. From Alberta to Amarillo, Hyatt Roller Bearings are the top favorite in oil fields.

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Over the years, Hyatt Roller Bearings have conclusively proved they save power, extend equipment life, last longer with less maintenance. To keep production flowing, the best bearings you can buy are the most economical—HYATTS!

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Try *TOUGHNESS* in your next well. We welcome "alternate rod" tests of Grade "O" against any rod in its low price class—call your nearby "Oilwell" Store. *USS and "Oilwell" are registered trademarks*

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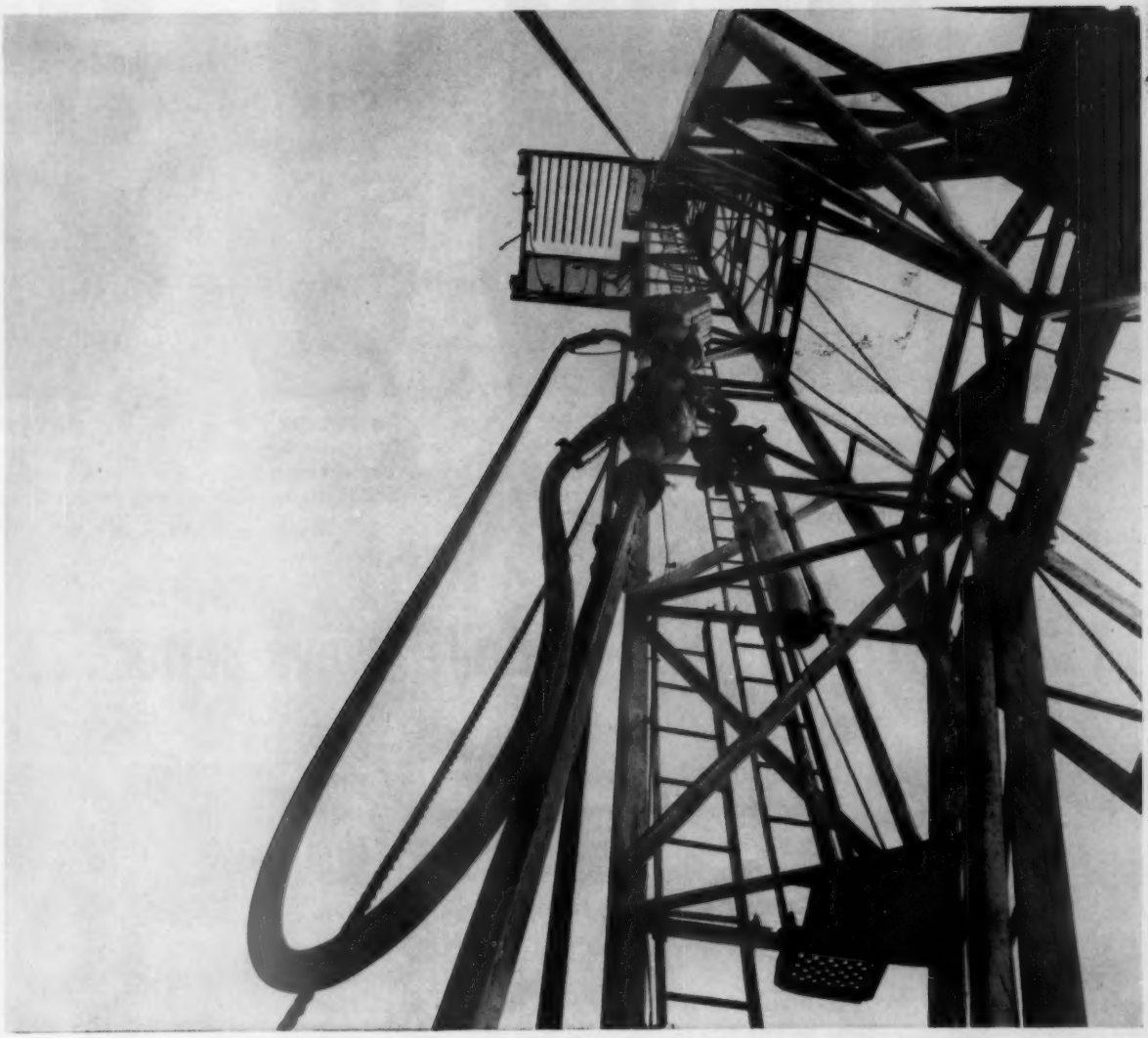

2½ years, 200,000 feet drilled with B.F.Goodrich hose on the rig

THAT B.F.Goodrich rotary drilling hose has paid for itself and has given its owner a 50% bonus in service. Previous hose used on this rig gave out after just a year. But B.F.Goodrich hose, after 2½ years in which the rig drilled a total of 200,000 feet, was still going strong. And there hadn't been a minute of downtime for hose maintenance.

Here's why. B.F.Goodrich Highflex hose has a thick, tough cover that can take plenty of abuse. It resists banging, gouges, scrapes and tears. Weather doesn't weaken it. Oily mud doesn't cause swelling or rotting of the tube.

Highflex hose is built extra strong to take extreme bottom hole pressures. Spiral-wrapped cable wires used for reinforcement make it burst-resistant, qualify it for Grade C (5000 lbs. test pressure) American Petroleum Institute. Hose ends are reinforced with additional plies of wire and fabric to protect against bending stress, prevent hose blowouts at the coupling.

Strong as it is, B.F.Goodrich Highflex is also the most flexible hose made for heavy duty service. It's easy to attach to the rig, hangs well from the standpipe, coils easily without kinking.

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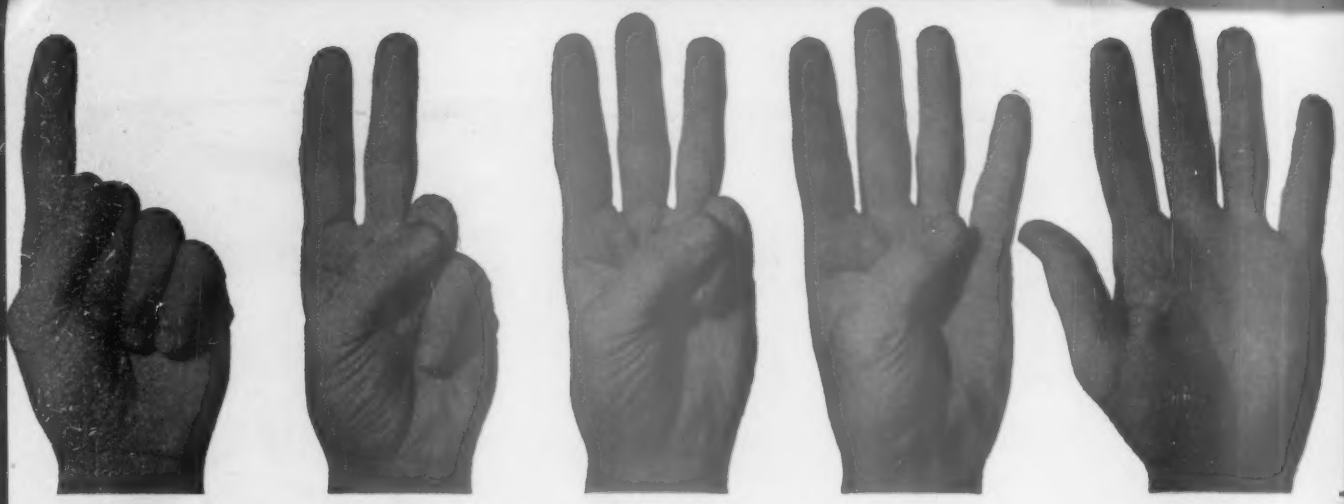
B.F.Goodrich

ROTARY DRILL HOSE



BETTER drilling rates in all types of muds: T-8, lime, gyp, and low pH, with varying amounts of oil.

BETTER (lower) barite requirements when substituted for oil in muds.

BETTER hole lubrication, in all types of muds, to reduce pipe sticking.

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MAGCOBAR PLANNED MUD PROGRAMS make the above statements facts, not claims. In high weight emulsion muds, for example, the Magcobar engineer properly substitutes Bit Lube® for some of the oil to cut drilling costs by reducing the amount of barite required. In a typical well, the oil content of the mud was allowed to drop from 11 to 5 per cent. Bit Lube was added to this 17.8 lb./gal. lime mud with these savings in barite:

	Sacks of barite per day	Cost of barite per day	Cost of Bit Lube per day	Cost of Oil per day	Total Cost per day
Emulsion (2 week average)	177	$409.76	$—0—	$74.03	$483.79
Bit Lube and Emulsion (3 week average)	52	120.38	122.43	8.25	251.06

NET DAILY SAVINGS WITH BIT LUBE: $232.73

Not only does Bit Lube give direct cost savings, but it also offers escape from costly pipe sticking, even in extreme directional holes. Bit Lube lowers the friction coefficient of the mud, to give over-all higher drilling mud performance. These savings can be added to those in the chart.

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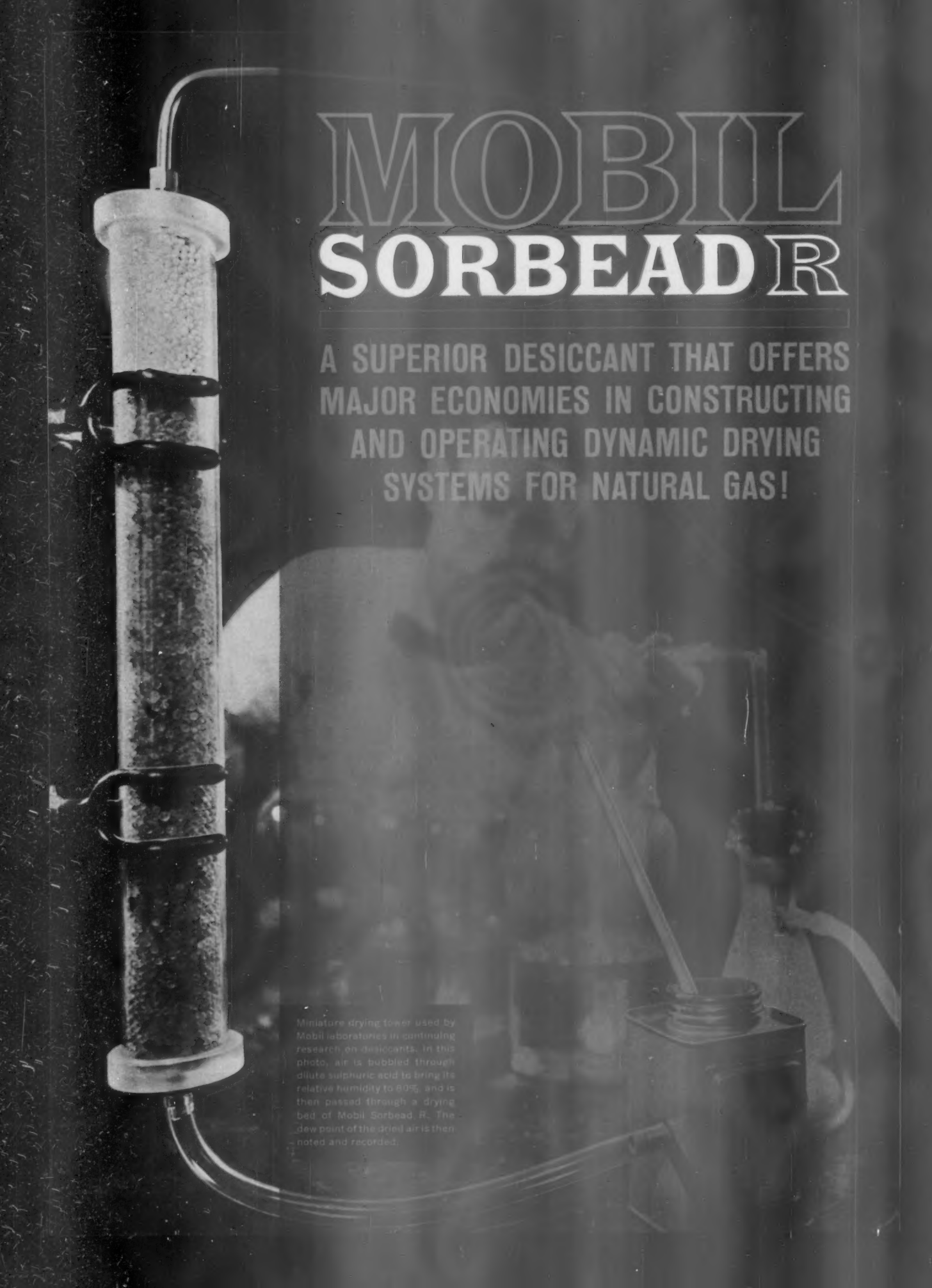

Miniature drying tower used by Mobil laboratories in continuing research on desiccants. In this photo, air is bubbled through dilute sulphuric acid to bring its relative humidity to 80%, and is then passed through a drying bed of Mobil Sorbead *R*. The dew point of the dried air is then noted and recorded.

If you are designing or building a new gas drying plant . . .

A MESSAGE OF IMPORTANCE FROM MOBIL:

To assist you in selecting a solid desiccant for your new gas drying system, Mobil offers these facts about Sorbead R, a superior drying agent that offers many advantages and permits major economies both in constructing and operating your dehydrating system.

Economies in constructing your new drying system

You can use smaller, more economical dehydrating units when you employ Mobil Sorbead R. Less Sorbead R by weight is required for a given application, because Sorbead R has a higher break-point capacity than practically all other desiccants.

Further, Mobil Sorbead R has a higher bulk density than granular desiccants. This permits the packing of the desired weight of Sorbead R into a unit smaller than that required for the same weight of granular desiccant, and means additional economy in constructing your dehydrating unit.

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Systems utilizing Sorbead R also realize substantial savings in regeneration fuel costs. Mobil Sorbead R is easily regenerated by heating to 300°-500°F., while many other desiccants require higher regeneration temperatures. In addition, for any given rate of flow, Sorbead R requires less frequent regeneration than other desiccants because of its greater adsorption capacity. A case in point: A plant dehydrating 100 mmscfd gas reduced regeneration fuel cost by over $4000 a year with Sorbead R.

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Mobil Sorbead R has a high capacity for liquid hydrocarbons and is exceptionally effective in the recovery of valuable condensable hydrocarbons when used for this purpose. A typical 20 mmcfd unit can produce as much as $50,000 per year in additional revenue through such recovery.

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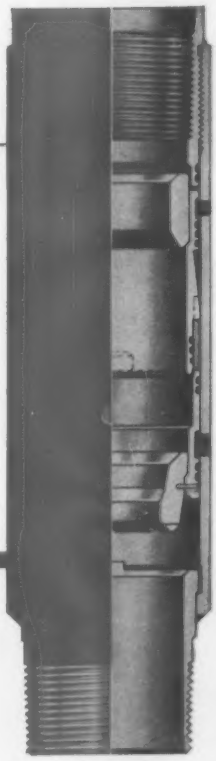

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Recognized by oil men as "the most versatile multiple stage cementer," the "DV" is the only tool which permits three stage cementing in one operation.

Developed by Halliburton's 35-year research program and backed by experience on three million well jobs, the "DV" Multiple Stage Cementer has saved operators casing, time, and money. Take advantage of this precision designed, multi-purpose cementing tool. Your local Halliburton Representative will give you full particulars.

NOW 2 OR 3 STAGE CEMENTING ON 1 STRING WITH THE

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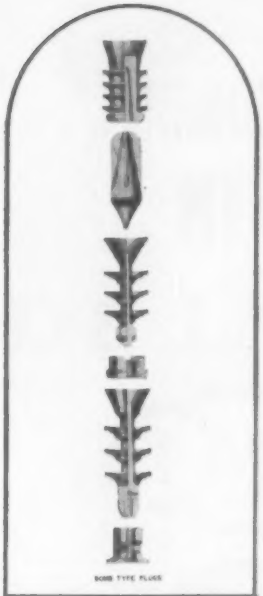
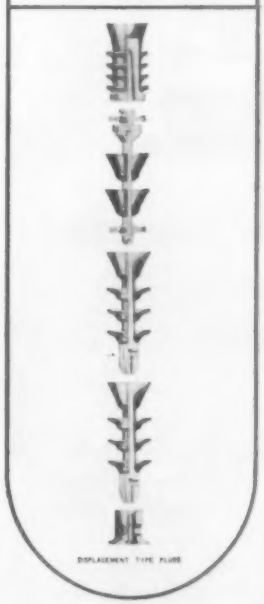




. . . an advanced tool to help overcome the former limitations of well depth, temperatures and pump pressures in multiple stage cementing.

OPERATION

The "DV" Multiple Stage Cementer consists of two internal steel sleeves, housed in an external steel case, so constructed and arranged that the ports through the wall of the tool can be opened and permanently closed by the use of plugs pumped down with the cement slurry and displacing fluid.

The tool may be used with either Bomb Type Plugs or Displacement Type Plugs.

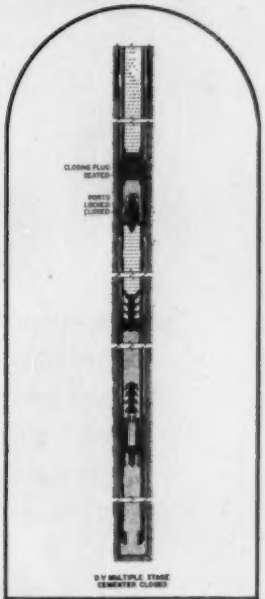
BOMB TYPE PLUGS

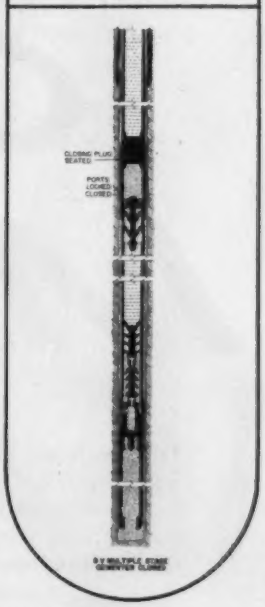
Are used where cement is not required on the bottom stage to fill the annulus to the point where the "DV" tool is located . . . or, where the distance between the tool and the casing shoe is relatively large. With this type plug, the first stage of cement may be allowed to set, minimizing the chance of possible blow-out, before additional stages are placed in the casing.

DISPLACEMENT TYPE PLUGS

Are used where bottom stage cement is needed to fill the annulus to, or above, the "DV" tool . . . or where the distance between the tool and casing shoe is relatively small. With these plugs, cement stages may be run continuously, saving additional time.

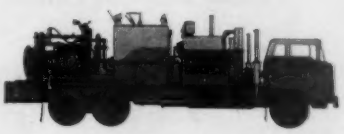
If stage cementing is the answer to your next problem well, use the Halliburton "DV" Multiple Stage Cementer . . . and use it with confidence.





CEMENTING SERVICES

275 service centers . . . just minutes away from your well



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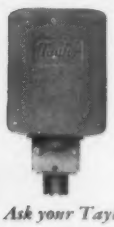
GET THE MOST READABLE SCALE ON THE MARKET

The new Taylor 210T TRANSCOPE® Transmitter is only 7″ x 9″ x 4″. Yet you can read the big 11¾″-long scale up to 35 feet away. New tape drive or with optional servo-driven indication, these low-cost, motion-balance pneumatic transmitters have ample power for process alarms, digital encoders, potentiometers and other auxiliary functions — *with no loss of accuracy.* Transmitted signal remains within ½% of the input signal. Threshold sensitivity is 0.1%.



Other features of the 210T TRANSCOPE Transmitter include the weatherproof case which is split diagonally to make adjustments easily accessible. Single package pneumatics, encapsulated movements and actuating element are easily removed and replaced for on-the-job maintenance. Designed for Gage Pressure, Volumetric Pressure, Volumetric Load and Temperature. Non-indicating model (211T) also available.

Ask your Taylor Field Engineer or write for **Bulletin 98385.** *Taylor Instrument Companies, Rochester, N.Y., or Toronto, Ont.*

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Here's data on the ideal pump for petroleum processing applications

Announcing NEW DE LAVAL IMO Pump Bulletin

New Bulletin 3200 contains all the data you need on De Laval IMO constant-displacement, rotary, screw type pumps. In its pages you will find (1) extensive application data including charts on fuel oil, SAE oil, and turbine oil viscosities; (2) selection information, including specific examples; (3) complete performance data on each IMO model as well as (4) dimension drawings and tables. Write today for your copy of this valuable, 40-page bulletin on the unique IMO pump.

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at extremely low cost

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POLYFLO™ *inhibitor-dispersants: Made in three formulations. Stabilize against thermal changes, color deterioration, sludge and deposit formation.*

DRIACIN® *dispersant-additive: Specially formulated for unstable heating and diesel fuels. Limits growth of colloidal particles, prevents clogging of filters, formation of rust in storage tanks.*

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No one inhibitor or inhibitor-dispersant can fully and effectively protect *every type* of distillate fuel. Each needs its own proper inhibitor selection, which must be determined on the basis of a comprehensive analysis of the fuel to be treated.

In response to this need, UOP offers a unique and highly valuable service that includes determining your precise inhibitor needs, based upon inspection and study of your fuels. From this analysis, we will determine the best inhibitor or most effective inhibitor blend recommended for each type of fuel you market.

Use of the correct inhibitor or blend of inhibitors for a given distillate fuel assures maximum stability at minimum cost. Reduced concentration of inhibitors also minimizes water absorption.

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WHERE RESEARCH TODAY MEANS PROGRESS TOMORROW

a christmas tree is only as strong as its weakest seal

Rector makes the hook-up that is Sealed with Steel throughout

Rector wellhead equipment is designed to insure a leak-proof seal at all connections. Compare Rector's metal-to-metal seal features with any equipment on the market using resilient packing between casing and tubing strings. The Rector principle of reinforcing temporary organic packing with a permanent ring of steel insures a positive leak-proof completion every time. Rector's built-in welding ring coupled with an API ring gasket is easy to install, immune to corrosion inhibitors, will not flow under high pressure or temperature, will not freeze or contract under low temperature, will not burn out, and never requires maintenance or replacement.

There are no weak links in your completions, when you specify Rector equipment at your favorite supply store, or from your Rector representative.

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See why ALCOA ALUMINUM makes good designs better

Requirement: achieve these major process equipment design aims: minimize product contamination . . . lengthen equipment life without adding maintenance costs . . . keep first cost down.

Key to Good Design: Alcoa Aluminum to eliminate contaminants, improve corrosion resistance, deliver strength without extra weight for design economies—at low first cost.

The evolution of process equipment design has developed a significant trend toward the use of aluminum—Alcoa® Aluminum—to satisfy increasingly stringent requirements of modern processing. At the base of this trend has been one factor: a growing awareness that aluminum provides a combination of chemical and physical properties perfectly suited to the needs of a particular process and the equipment which contains it.

Take, for example, the needs of a low pressure polyethylene process such as the one diagrammed below. The primary need here is for equipment which will not impart contaminants which discolor the product. The obvious design answer is aluminum with its demonstrated ability to prevent such contamination. Add to this such other important aluminum design benefits as these:

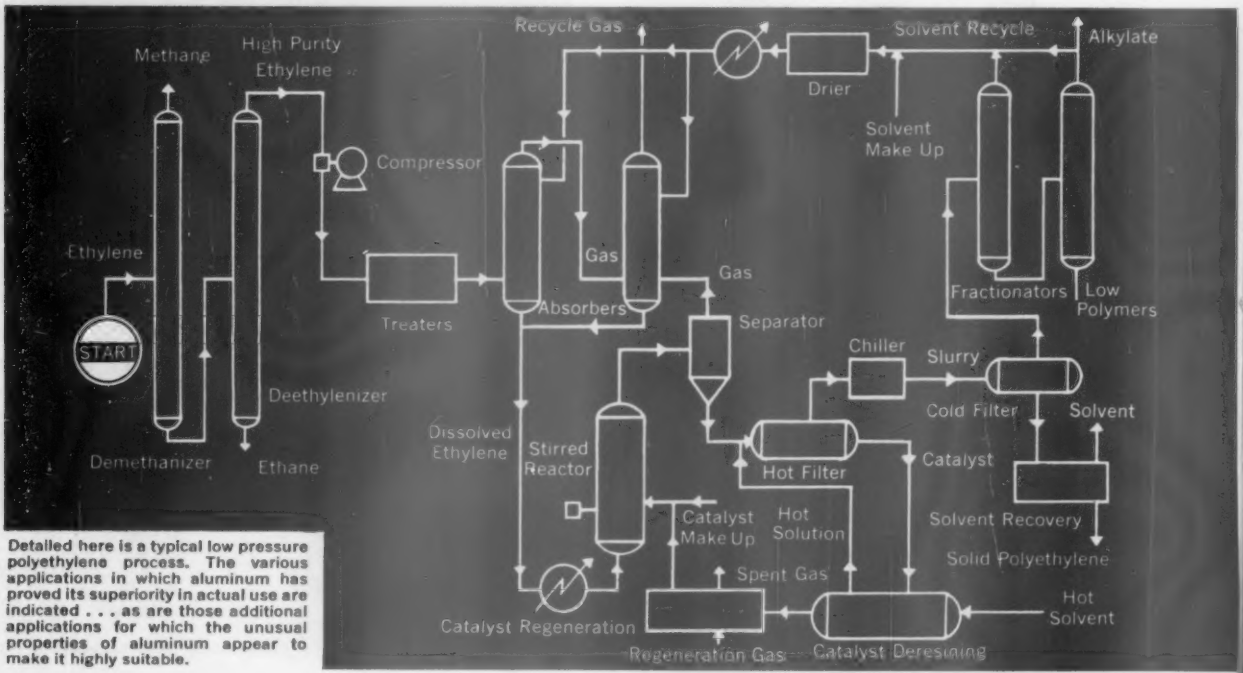
It provides a level of corrosion resistance unique among commonly used metals; its low temperature properties are outstanding (tensile and yield strengths actually increase without embrittlement as operating temperatures drop); it is nontoxic; its strength-weight ratio surpasses that of nearly every other metal; and its first cost is far lower than that of other suitable materials.

To take advantage of this unusual range of characteristics, designers and builders of polyolefin plants have employed Alcoa Aluminum in such varied equipment applications as heat exchangers, dryers, cyclone bins, cube storage bins, piping and a host of others.

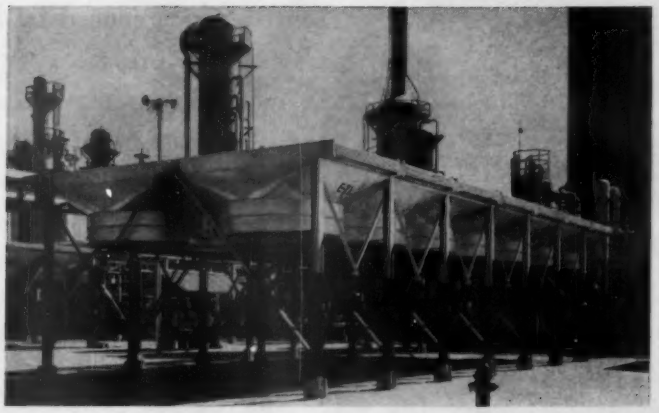
And polyethylene represents just one of literally hundreds of processes in which aluminum provides important design benefits on equipment applications of nearly every type. A few of these are shown on the opposite page. In nearly every case, aluminum's benefits can be predicted with surprising accuracy—thanks to the large volume of factual service data developed by Alcoa in well over 40 years of applying aluminum to process equipment requirements. Alcoa engineers are anxious to share this experience with you. They are doing so through a series of engineering conferences being held this year in major cities throughout the country. Your local Alcoa sales office will furnish you with details.

Examine the large body of Alcoa technical literature which describes in detail the proven performance characteristics of aluminum in a variety of process industries uses. Simply fill in and mail the coupon opposite.

World-wide sales through ALCOA INTERNATIONAL, INC., 230 Park Avenue, New York 17, N.Y.

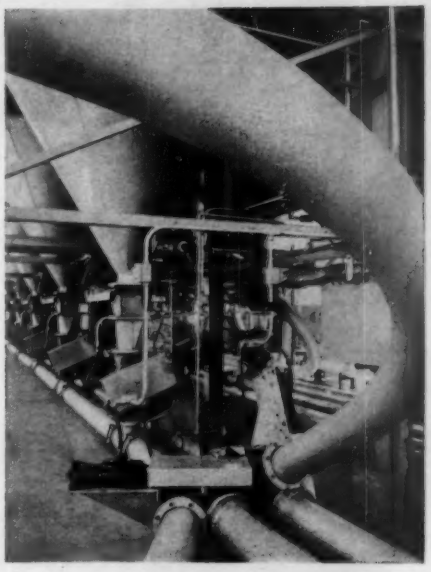


Detailed here is a typical low pressure polyethylene process. The various applications in which aluminum has proved its superiority in actual use are indicated . . . as are those additional applications for which the unusual properties of aluminum appear to make it highly suitable.

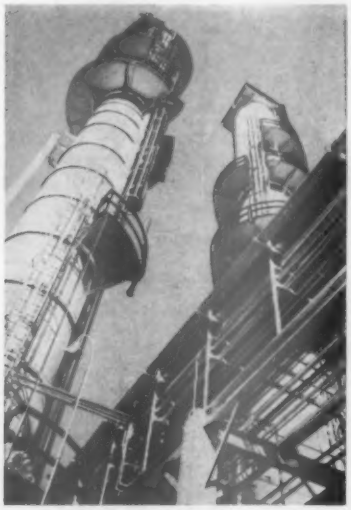


Below, aluminum's ability to maintain its serviceability and excellent appearance in chemically contaminated atmospheres is utilized here in Al-Cor-Jac alclad aluminum jacketing—manufactured by Insul-Coustic Corporation, Maspeth, Long Island, N.Y.

Pictured above is a Solo-aire cooling unit manufactured by Hudson Engineering Corporation, Houston, Texas. Here the excellent heat transfer properties of aluminum made it a natural choice for process cooling. Of important added value are the excellent corrosion resistance of aluminum and its outstanding low temperature properties.



Right, this polyethylene process employs a variety of aluminum applications to prevent product discoloration. Since the process operates at extremely low temperatures, aluminum's excellent low temperature durability is an important asset in piping, bins, hoppers and vessels.



These prilling towers and nearly all of the piping and equipment surrounding them are aluminum. Selection of Alcoa Aluminum was based upon the metal's unique ability to withstand corrosive attack in this nitrogen fertilizer operation — plus its excellent strength-weight ratio which contributes to economical design by eliminating the need for excessive structural support.

ALCOA ALUMINUM

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Please send me the following literature covering Alcoa Aluminum for tubular products and other uses in the process industries:

- ☐ 10197 Aluminum Pipe and Fittings
- ☐ 10418 Alcoa Unitrace: Combines Piping and Tracing in One Unit
- ☐ 514 Alcoa Duotrace Technical Report
- ☐ 10270 Alcoa Utilitube
- ☐ 10460 Process Industries Applications of Alcoa Aluminum
- ☐ 11453 Solving Refinery Corrosion Problems with Aluminum
- ☐ 20849 Resistance of Aluminum Alloys to Weathering and Resistance of Aluminum Alloys to Chemically Contaminated Atmospheres
- ☐ 20437 Aluminum Alloy Heat Exchangers in the Process Industries
- ☐ 19416 Brazing Alcoa Aluminum
- ☐ 19415 Welding Alcoa Aluminum
- ☐ 19051 Alcoa Aluminum Handbook

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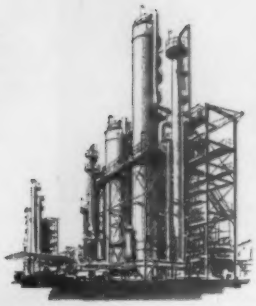


These valves, produced by a new manufacturing concept and incorporating the exclusive rotating seat principle, assure astounding improvements in service life, ease of operation and reliability. This makes practical — for the first time — the "sealed for life" construction.

No lubrication + No glands + No bonnet gaskets = No maintenance. With no maintenance expense for lubricants, labor or down-time, the Cameron Ball Valve (which is competitively priced) is certainly the most economical valve available as extensive tests and many installations have proven that it will outlast usual expectations by many times.

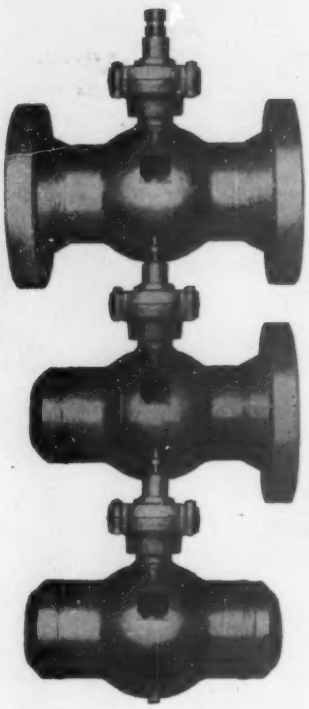
NO LUBRICATION
No worries with lubricating procedures or line contamination.

NO MAINTENANCE
Sealed for life.

BUBBLE-TIGHT
Seals both upstream and downstream—body can be bled and flushed.

ROTATING SEATS
Increases normal life expectancy by three to four times.

EASY OPERATION
Cannot freeze or stick.



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Available in reduced and full bore sizes 2" to 36" and larger in the full range of ASA and API ratings and with any type of end preparation desired. Call or write

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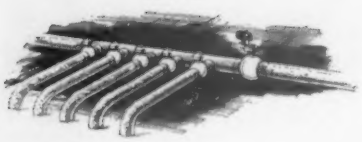
Maximum simplicity. Minimum size and weight.



Cameron

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Christmas Trees from REPUBLIC SUPPLY!

True, they are not the kind on which children hang tinsel and brightly colored ornaments.

They are, however, quality, rugged trees of iron and steel made by leading manufacturers in this field. REPUBLIC SUPPLY has them available, not just in December, but the year 'round — as they have for the past 50 years!

Like the "Christmas Trees," REPUBLIC SUPPLY and all the other quality products they represent stand as a symbol of the free world, free enterprise and a Christian nation which pauses during this joyous season to count our many blessings.

May yours be bountiful!

REPUBLIC SUPPLY COMPANY

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MISSILES TO MUFFLERS

Bridge production gap for oil field manufacturer

Beaird-AMF A company on the go!

NEW PRODUCTS, SKILLS, IDEAS SPARK DRIVE

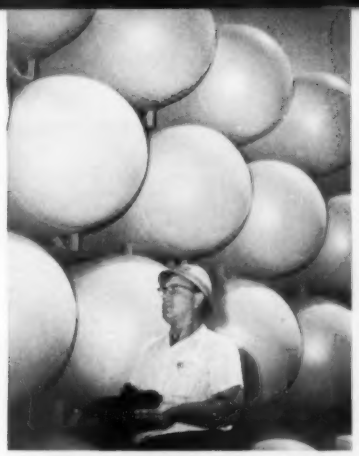
Under the guidance of a tall (6′3″) soft-spoken Texan, President John L. Tullis, Beaird is on the rebound from a low caused when the oil industry skidded into its own personal recession in 1958.

Long a major supplier of equipment (skid-mounted packaged compressors, pressure storage vessels, rail tank car tanks, steel piling, LP-Gas transports and home LP-Gas systems), Beaird has repeatedly demonstrated its ability to move swiftly in a competitive situation. Pioneering with the first packaged compressor plant in 1946, they established and dominated the market for this product despite intensive competition. Equally in the LP-Gas industry, Beaird moved, in five years, from its first LP-Gas system in 1946 to the industry leadership, with a host of products serving every phase of the market from dealer to home.

Now entering new markets with new creatively engineered products ("Belex," a self-operated condensate recovery unit for installation at wellheads and a skid-mounted complete gasoline plant composed of eight separate processing units), Beaird has received an additional boost from acquisitions and defense contracts. Maxim, the oldest name in silencers (gross sales $3,000,000 in 1959) has been acquired by AMF and assigned to Beaird to manufacture and market. The bustling shop program is also producing an $8,500,000 order for giant Atlas Missile launching components and a large order for stainless steel Titan missile fuel tanks. Beaird has targeted a stepped-up sales goal in '60 and is headed upward with a rush that may well take it far beyond its most optimistic predictions. From its people in the shops to its wide-flung dealer and sales organization, there is a firm belief that Beaird-AMF is a company on the go . . . *and getting there in a hurry!*

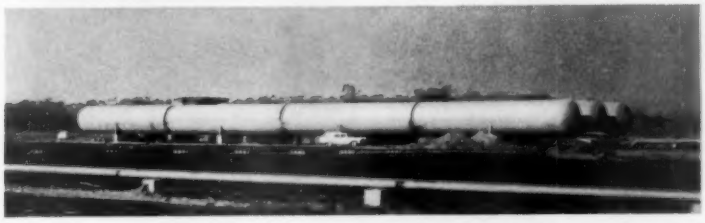
BEAIRD - AMF

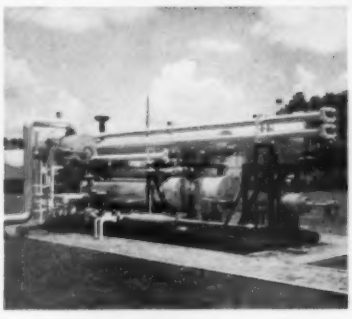
World's Largest Fabricator of LP-Gas Systems



Long lasting enamel finish is just one of many basic improvements Beaird has brought to LP-Gas industry. To make new finish possible Beaird installed giant "assembly line" plate shot blast equipment at both Shreveport and Clinton plants. Beaird has continued to strengthen its LP-Gas market position with a vigorous dealer program that includes area stocking and long term financing.

CO_2 Transport, has welded aluminum shell over four inches of insulation that surrounds the T-1 steel . . . 325 psi tank. Other specialized Beaird units are formed of stainless steel for chemical hauling. T-1 Steel Transports for LP-Gas Market lead Beaird transport sales.

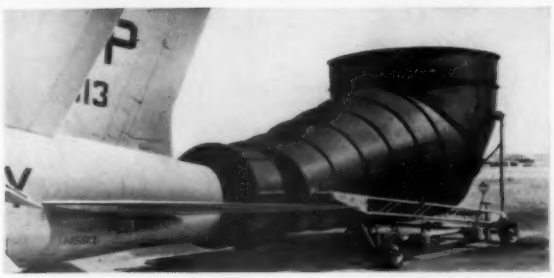




World's largest LP-Gas storage vessels — capacity 5,000 bbls. each were built by Beaird for Creole Petroleum, Venezuela. One of firm's oldest and best known products, Beaird storage vessels are manufactured in a size range from 6,000 wg. to 105,000 wg. capacity for the oil, gas and petrochemical industries.

Belex Condensate Recovery unit, mounts at wellhead to extract hydrocarbons (gasoline, propanes, methanes, etc.). Fully packaged and automatic in operation, the Belex unit offers high product recovery with low installation cost.

10,000,000 Cubic Feet of Gas per Day can be handled by this Beaird Skid Mounted Gasoline Plant. Expensive field labor and installation hook-up is reduced to minimum and the plant is almost wholly salvable when moved to a new location. It was process engineered and installed by O. L. Olson Engineering, Houston, Texas.



Twenty-five ton silencer, one of the many Maxim silencers now produced by Beaird. Others include little two-pound units for home lawn mowers, sizes for heavy duty engines and special types for ships and industrial plants.

Navy Submarine has an AMF-Maxim monel and stainless steel sea water plant which demonstrates Beaird's new metal handling skills. Fabrication including welding of aluminum and magnesium for rail tank cars as well as work in other exotic metals has become a routine assignment at Beaird.

another AMF BEAIRD product

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BEAIRD INTERNATIONAL, INC.

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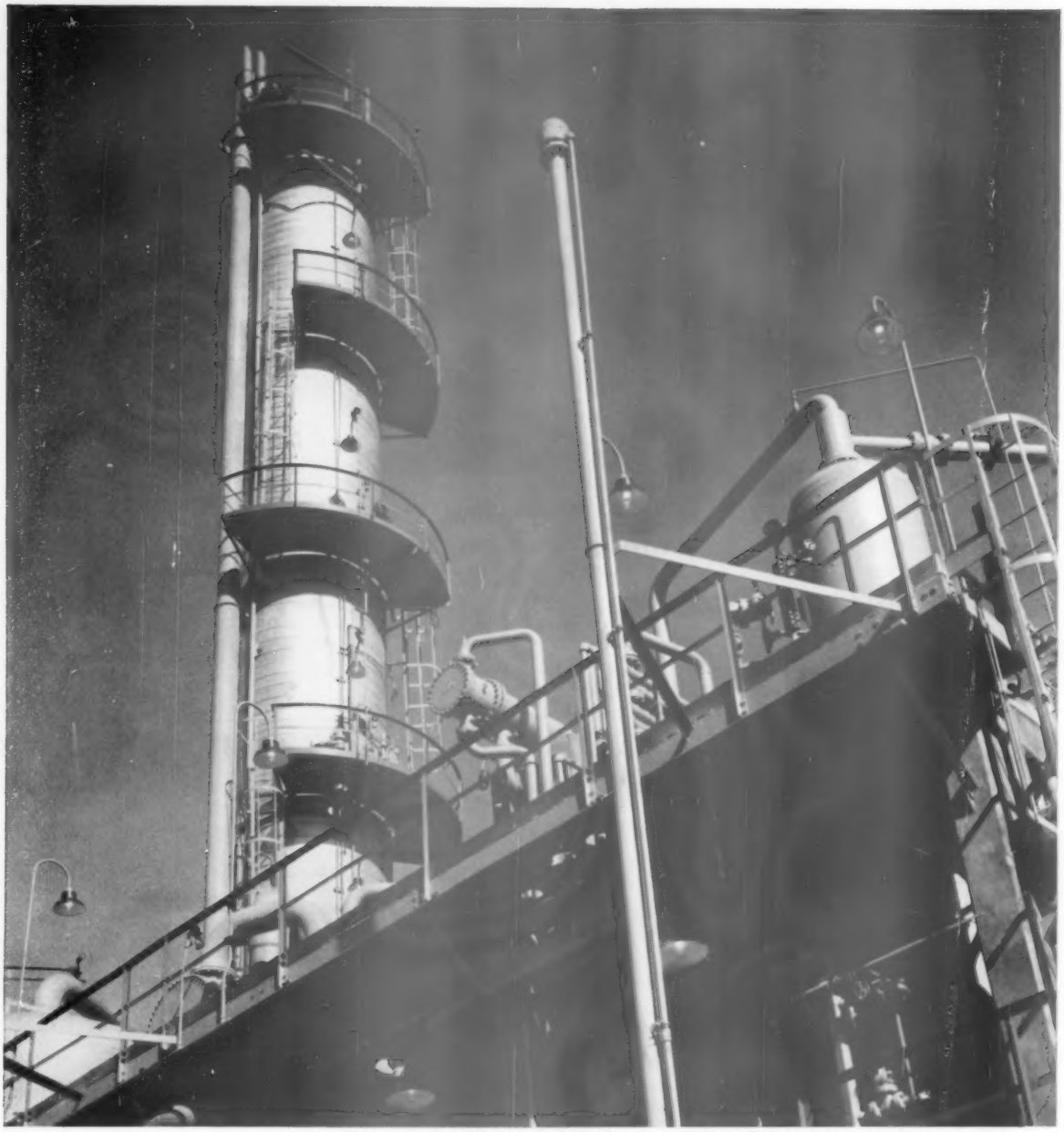
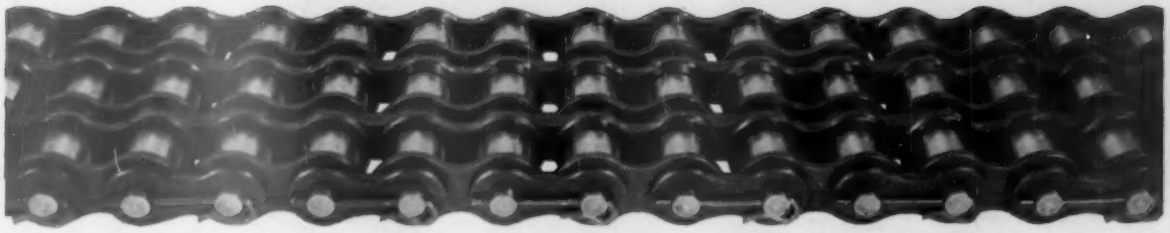


This new plant of Humble Oil & Refining Co. at Baytown, Texas, employs a continuous process for producing large quantities of polypropylene - raw material for a wide variety of useful plastics.

"We cannot afford to be inefficient in the use of capital or labor. We must aim at increased national productivity; we must stimulate research and invention; we must reward ability and initiative; we must encourage capital generation and productive investment. If we fail to do these things we will move backward in the world picture instead of forward."

—Leo D. Welch, Chairman of the Board

Standard Oil Company (New Jersey)



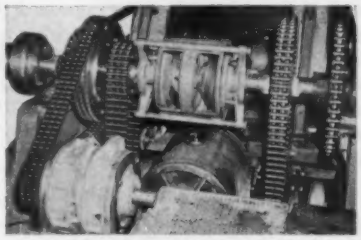
Another of the invisible extras that insure MORE ON-BOTTOM TIME with LINK-BELT FR® roller chain

Cyclic-tension test verifies

top fatigue strength

Fatigue Resistant FR* processing of sidebars lengthens the life-span of Link-Belt roller chain. FR increases chain's endurance limit by compressing the metal around pitch holes . . . the critical sidebar areas most vulnerable to fatigue failure.

On the test equipment above—the industry's largest and fastest fatigue machine—Link-Belt has proved conclusively the superior fatigue resistance imparted to roller chain by the FR process. The machine produces up to 65 tons of cyclic tension. Rapid "stress-on, stress-off" action duplicates toughest conditions of rig operation. From such facilities for research, production and quality control—plus extensive field testing—Link-Belt roller chain inherits invisible extras that withstand the grueling tensions of drilling service.



COMET PORTABLE DRILLING RIG, built by Cabot Shops, Inc., Pampa, Texas incorporates Link-Belt FR roller chain.

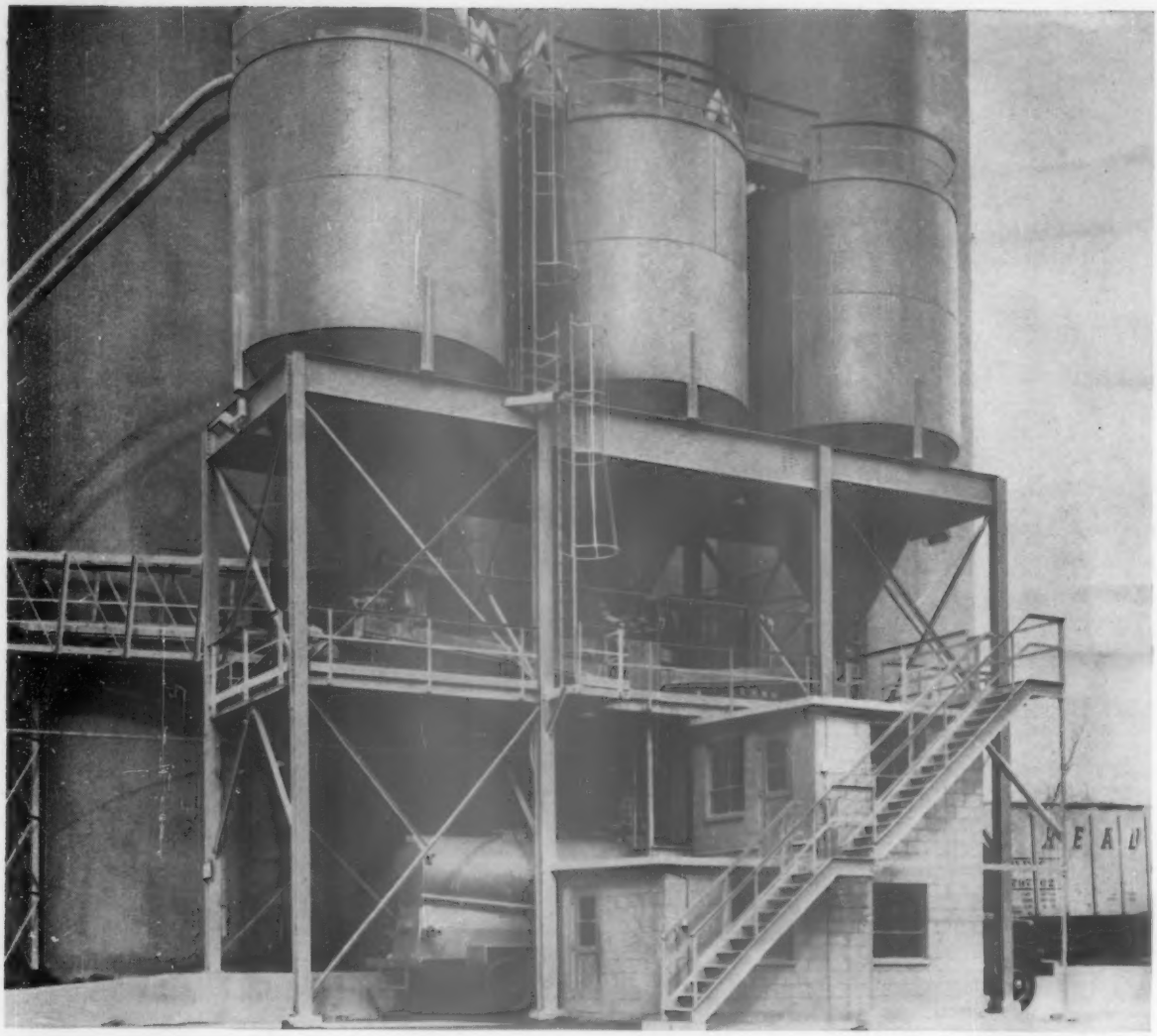
For engineering assistance in applying FR roller chain, write Link-Belt Company, Indianapolis 6, Indiana. Ask any leading supply store for our Catalog 2980 containing full information on roller chain and other oil field equipment.

**U.S. Patent No. 2,517,497*

LINK-BELT COMPANY: Indianapolis 6, Houston 1, Dallas 26, Odessa, Tex., New Orleans 16, Shreveport, La., Los Angeles 22 (Montebello), Scarboro (Toronto 13); Export Office, New York 7. Distributors in All Fields. 15.553-A

LINK-BELT

ROLLER CHAINS AND SPROCKETS



Why 9 Out of 10 New Bulk Loading Stations Use Airslide Conveyors

Fuller Airslide® Fluidizing Conveyors are the overwhelming choice for bulk truck-loading because dry pulverized materials, such as cement and barite, are bulk-loaded cleanly and efficiently in less than 5 minutes per truckload. One man can control the entire loading operation. Problem of dust is minimized since dust can be easily vented to dust collectors.

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Material is conveyed on a blanket of air in the upper chamber of the two-chamber conveyor. Low pressure air is blown through the lower chamber, from which it passes upward through a layer of porous fabric. There is no need for moving parts, no noise, no lubrication. And fluid delivery by air means ease of control and fast shut-off when necessary.

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Airslide Conveyor installations are characterized by their low horsepower consumption.

Airslide Conveyors are efficient and economical in operation too. Fuller engineers will gladly tell you more about how they can apply to *your* bulk loading needs. Write us at the address below. 2334 G-238

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pioneers in harnessing AIR

Photographed at Standard Oil of Ohio, (Toledo Refinery)

The constant challenge and the continuous answer

The demand for ever-superior fuels from refiners is constant. The search for ever-better catalysts to help produce these fuels is continuous. At the oil companies and at Cyanamid, the searchers have found that each challenge can best be met by pooling knowledge and resources. In a word, the continuous answer lies in *cooperation*.

Cooperation with refiners helped Cyanamid develop an answer in Aerocat® micro-spheroidal synthetic catalyst. Aerocat provides high activity, stability, and selectivity through controlled physical properties. You can depend on Aerocat for efficient overall performance and satisfactory product realization.

The Cyanamid sales representative—the Man with the Golden Rule—played an important role in developing Aerocat and other catalysts. His job is not simply to sell. His job is to help you in your continuous task to meet the constant challenge. Behind his knowhow are the resources of a major catalyst producer that is also a major manufacturer of other chemicals—Cyanamid. Call when you need the aid of his skill.

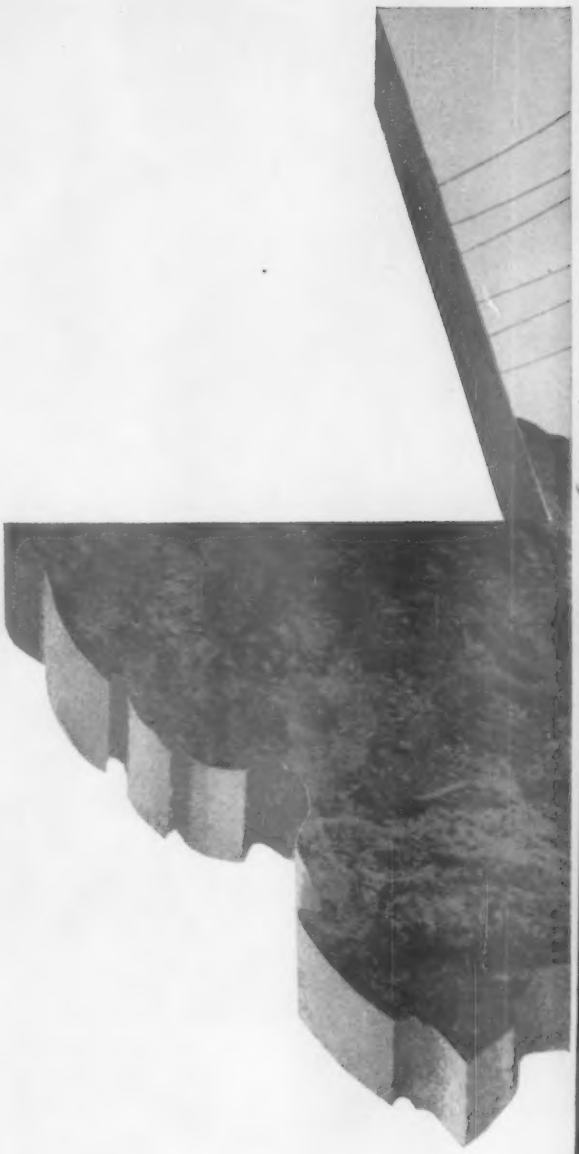
Basic in catalyst chemistry

CYANAMID

AMERICAN CYANAMID COMPANY • REFINERY CHEMICALS DEPARTMENT • 30 Rockefeller Plaza, N. Y. 20, N. Y.

Old Ocean Fuel Company builds 367-mile pipeline...

to meet needs of electric utility for huge quantities of natural gas



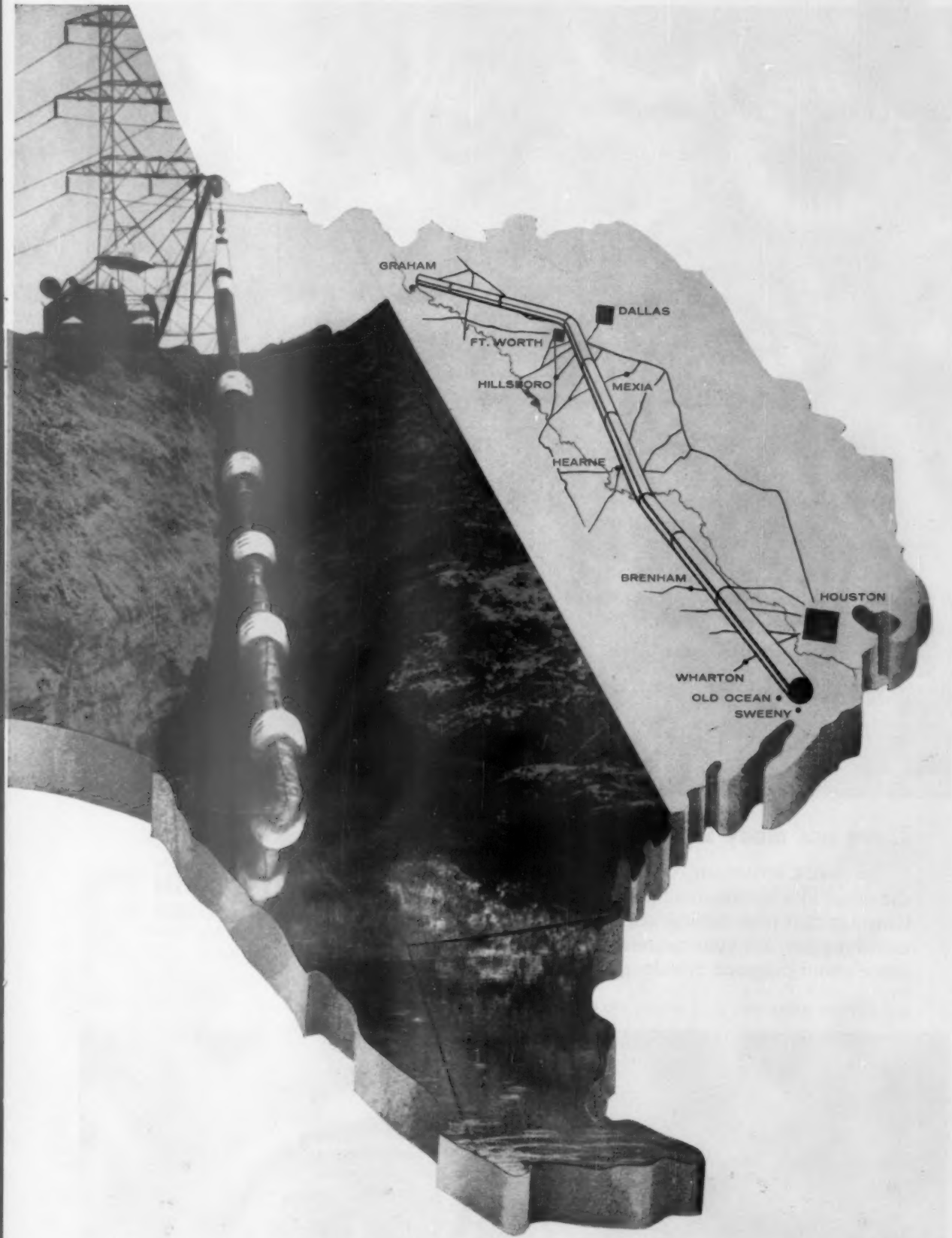
Pipeline to carry fuel gas from Old Ocean field to four of the steam-electric generating stations of the Texas Electric Service Company power system

Old Ocean Fuel Company, subsidiary of Texas Electric Service Company, has recently completed a gas pipeline which spans the 367 miles between the Old Ocean gas field in Brazoria and Matagorda Counties and the Fort Worth and Graham areas. Natural gas transported in this line will keep four of the great power plants of Texas Electric Service Company's power system humming.

A. O. Smith of Texas supplied 273 miles of 24-inch and approximately 24 miles of 20-inch "Made in Texas" pipe for this project. Since our first shipment of pipe in 1927, A. O. Smith has produced over 50,000 miles of large-diameter pipe. From our Milwaukee and Houston mills comes a dependable supply of pipe for almost every major pipeline project.

Through research ...a better way

A.O.Smith
CORPORATION
TUBULAR PRODUCTS DIVISION
Milwaukee 1, Wisconsin


GRAHAM
DALLAS
FT. WORTH
HILLSBORO
MEXIA
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OLD OCEAN
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There are many Styles of Diamond Bits . . .

. . . because Christensen "custom engineers" diamond bits to overcome particular problems. On that next drilling, coring, reaming, or fishing job, ask your nearest Christensen office about diamond bits designed for you

"Less cost per foot"

CHRISTENSEN DIAMOND PRODUCTS

MAIN OFFICE AND PLANT 1937 SOUTH 2nd WEST
SALT LAKE CITY, UTAH

SERVICE FROM WORLD-WIDE SALES OFFICES AND MANUFACTURING PLANTS

THE S. M. JONES CO. ANNOUNCES

JONES TYPE 4

A NEW HIGH STRENGTH ROD WITH A JOINT TO MATCH

Now available—a new undercut sucker rod pin specifically designed to take advantage of the strength of the body of the new Type 4 Sucker Rod.

By stress relieving (undercutting) the pin shank, the stress concentration point of the runout thread where pins tend to fail is eliminated.

Available with rolled threads on special order. Also available with conventional API pin.

CHEMICAL ANALYSIS

Carbon	Manganese	Silicon	Chromium	Molybdenum
.39/.46	.65/1.10	.20/.35	.75/1.20	.15/.25

TYPICAL PHYSICAL PROPERTIES

Yield psi	Ultimate psi	% Elong. 2"	% Red. Area	Brinell	Izod
105,000	127,000	22	55	255	70

THE S. M. JONES COMPANY

Division of Buffalo Eclipse Corporation
General Office and Factory: TOLEDO, OHIO
Sales Office: Enterprise Bldg., TULSA, OKLA.
Export Department: The S. M. Jones Company

Charioteers learned 34 centuries ago that lubrication made things work easier, last longer.

Ancient Chinese invented a simple, rugged, efficient plug cock.

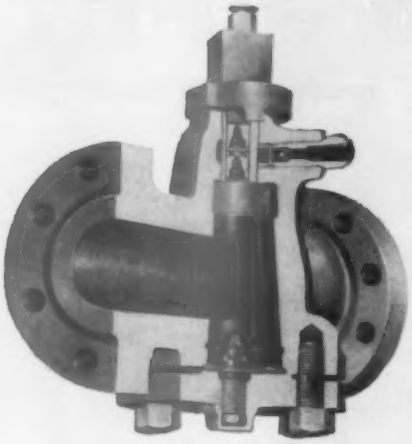
Blaise Pascal formulated principles of hydraulics in the 17th Century.

the idea:

The Perfect Application Of A Principle

Sven Nordstrom ingeniously applied Pascal's principles of hydraulics and created the first lubricated plug valve in 1916 . . . the world's first valve that shut-off positively without the uncertainty of wedging metal into metal.

the application:



How It Helps Give You A Better Valve

In the Rockwell-Nordstrom lubricated plug valve, lubricant is injected through the button head fitting and travels through the Sealdport® system of grooves in the valve body and plug. *Pressurized* lubricant hydraulically jacks the plug, minutely unseating it for instant ¼-turn operation. And pressurized lubricant also creates an impenetrable yet instantly replaceable seal between the plug and the body. The only moving part, the plug, is fully lubricated to prevent metal-to-metal wear.

the benefits:

Instant 1/4-Turn Operation . . . Positive Shut-off . . . Longer Life At Lower Cost . . . Easy Operation . . . No Exposed Seats . . . Instantly Replaceable Seal

The 6 million Rockwell-Nordstrom lubricated plug valves now used in a wide variety of industries are translating these benefits into dollars and cents savings day after day. Rockwell-Nordstrom is the most complete line of lubricated plug valves (sizes from ½" to 36"; pressures to 15,000 lb), lubricants and operating accessories. For *practical* help in solving your flow control problems, see your supplier or write: Rockwell Manufacturing Company, Dept. 92-M, Pittsburgh 8, Pa. Canadian Valve Licensee: Peacock Brothers Limited. If you live outside the U. S. or Canada, write: Rockwell International, S. A., Geneva, Switzerland.

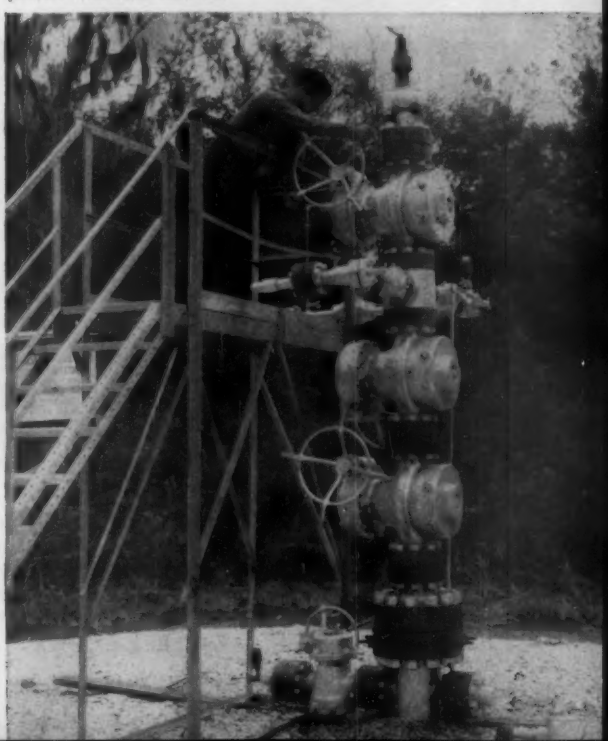
Lubrication Makes The Difference

ROCKWELL-Nordstrom VALVES

another fine product by

ROCKWELL

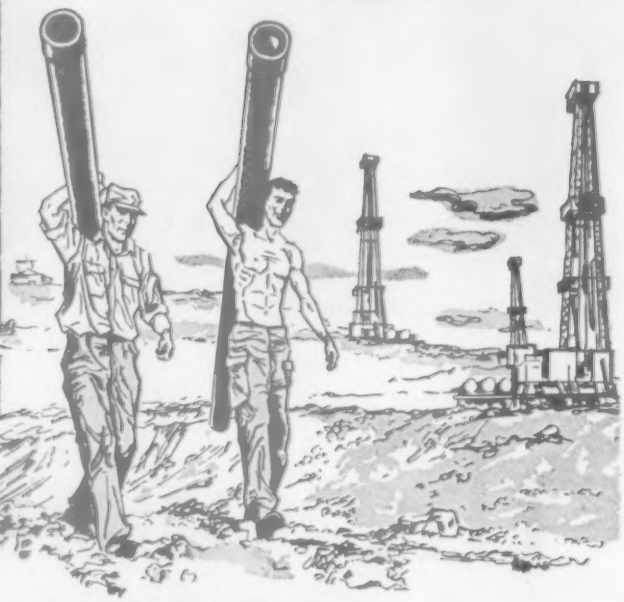
Rockwell-Nordstrom Christmas tree valves insure perfect well head control.



TROUBLE-FREE TRANSMISSION OF SALT WATER AND WASTE...

RIGID PIPE

made of **ABS** *Plastic*



RIGID PIPE OIL FIELD INSTALLATIONS OFFER NEW PROOF OF SUPERIORITY OVER CONVENTIONAL TYPE

BE *ABSolutely* SURE . . .
INSIST ON RIGID ABS PIPE
made of
CYCOLAC®
THE BORG-WARNER PLASTIC THAT IS TOUGH, HARD AND CORROSION-RESISTANT

- ★ Ideal for salt water tubing
- ★ For salt water disposal lines
- ★ For salt water gathering lines
- ★ For fresh water lines on leases
- ★ Carries sour crude safely
- ★ Handles all water flooding jobs

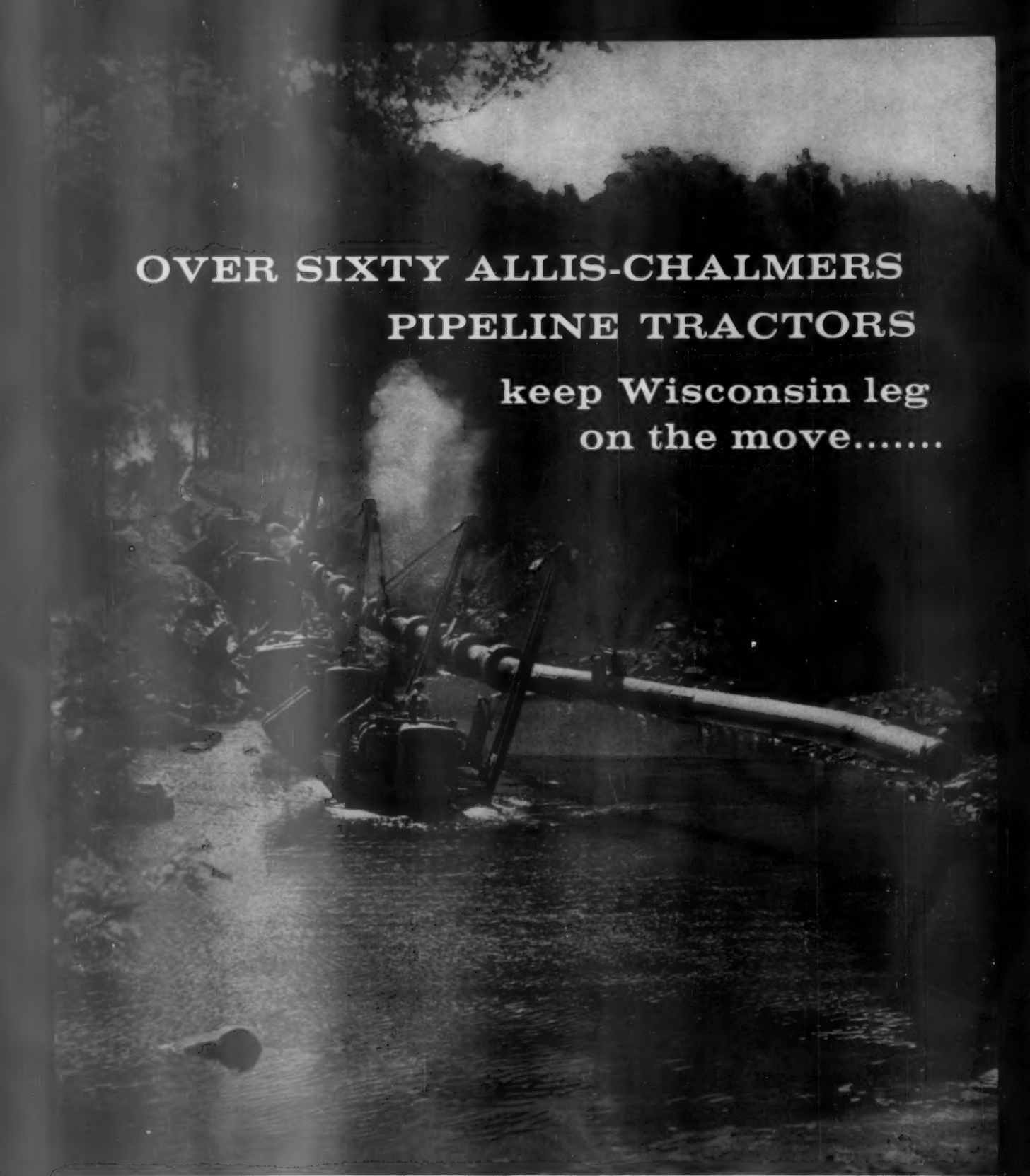
In Texas, Oklahoma, Kansas and Illinois—wherever oil is produced—ABS plastic pipe lines made of CYCOLAC are now on the job! Oil men have discovered that chemically-resistant, corrosion-free rigid ABS cuts both costs and man-hours. Rigid pipe is easily carried and quickly connected—two men can install over six miles in a day! Once installed, its smooth interior walls reduce friction and deliver more liquid, size for size.

Write for the name of your nearest supplier

MARBON CHEMICAL WASHINGTON

MARBON CHEMICAL B-W BORG-WARNER

DIVISION **BORG-WARNER** WEST VIRGINIA



As a result of Canada's decision to allow natural gas exports into the United States, several multimillion-dollar pipelines will run from the Alberta gas fields to California, Minnesota, and Wisconsin. Panama, Inc., Houston, Texas, pipeline contractor, is working 66 miles of 24-inch Wisconsin mainline from Marshfield to Chippewa Falls. In this scene near Willard, Wisconsin, five of Panama's sure-footed Allis-Chalmers side boom tractors are walking a 90,000-lb length into the rocky Black River.

RUGGED, STEADY, POWERFUL PRODUCERS

maintain peak progress figures on every phase of the job

Over 60 Allis-Chalmers pipeline tractors are constructing a major part of nearly 500 miles of main and feeder lines in Wisconsin alone. More Allis-Chalmers tractors are swinging through Minnesota into Canada . . . pounding away at the $70 million, 893-mile system of natural gas pipelines from the Canadian border near Emerson, Manitoba, southeast to Appleton, Wisconsin.

Across streams and prairies, through swamps, beds of granite, trap rock and limestone, these tractors have veteran pipeliners agreeing heartily on one fact: "For cradling and towing, Allis-Chalmers pipeline tractors are the best in the business."

1. **Clearing Right-of-Way**—Working a 1,500-ft stretch at a time for Panama, Inc., this 150-hp torque converter-driven HD-16 averages about 5,000 ft of cleared r-o-w per day. Thick tangle is no match for this fast-acting, cable-controlled angle dozer for picking a path through rugged brush country.

2. **Pipe Stringing** — Service Pipe Line Stringing, Inc., is stringing 130 miles of feeder line from Stevens Point to Wausau, Wisconsin, for Panama-Williams. Jim Harrist says: "This HD-11 is a honey for stringing pipe. As a tow tractor, there's no place this machine says 'can't go' . . . sometimes says 'almost can't' . . . but never 'can't'."

3. **Dope-Wrapping** — Harbert Construction Company has 85 miles of 16-in. main feeder lines from Weyauwega to Marinette, plus 17 miles of off-shoot laterals. J. C. Ward, dope crew super, says: "HD-16's are the best machines built for cradling and towing. They're smooth . . . keep everything moving at the right pace. Timing is the tough part of cradling — 16's make it a lot easier."

4. **Drilling River Bed Rock** — Panama, Inc. uses one of its 18 Allis-Chalmers tractors to help drill a river trench for blasting. Buck MacIntyre, spread boss, comments: "Allis-Chalmers has the best boom and tow tractors made. We haven't had a bit of trouble with our two-year-old boom spread . . . haven't touched a final drive . . . tracks have lasted 2-to-1 over any other."

5. **Making the Tie-in**—These 225-hp HD-21 side booms hold steady on the tie-in after gently lowering-in a 160-ft, heavily weighted section. As one operator puts it, "I know what's going to happen when I'm boomin' with an Allis-Chalmers . . . and so do the guys on the ground. The boom controls are positive, handy and easy to work."

6. **Lowering-in**— One of Houston Contracting's HD-16 side boom tractors makes ready to lower-in and move ahead. Houston's 92 miles of 24-in. mainline between Appleton and Marshfield, Wisconsin, is a tough stretch with water-filled trenches and plenty of swamp. Good tractor flotation helps Houston's rapid progress.

7. **Backfilling**—Backfilling and cleanup operations along Panama, Inc.'s 66-mile mainline have to move fast to keep pace with the pipe-laying crew. Here, one of the five HD-16 torque converter dozers keeps the trench covered close behind the tie-in crew. This operator likes the speed and easy handling of the *16* . . . says it will cover twice the trench of an ordinary dozer in the same amount of time.

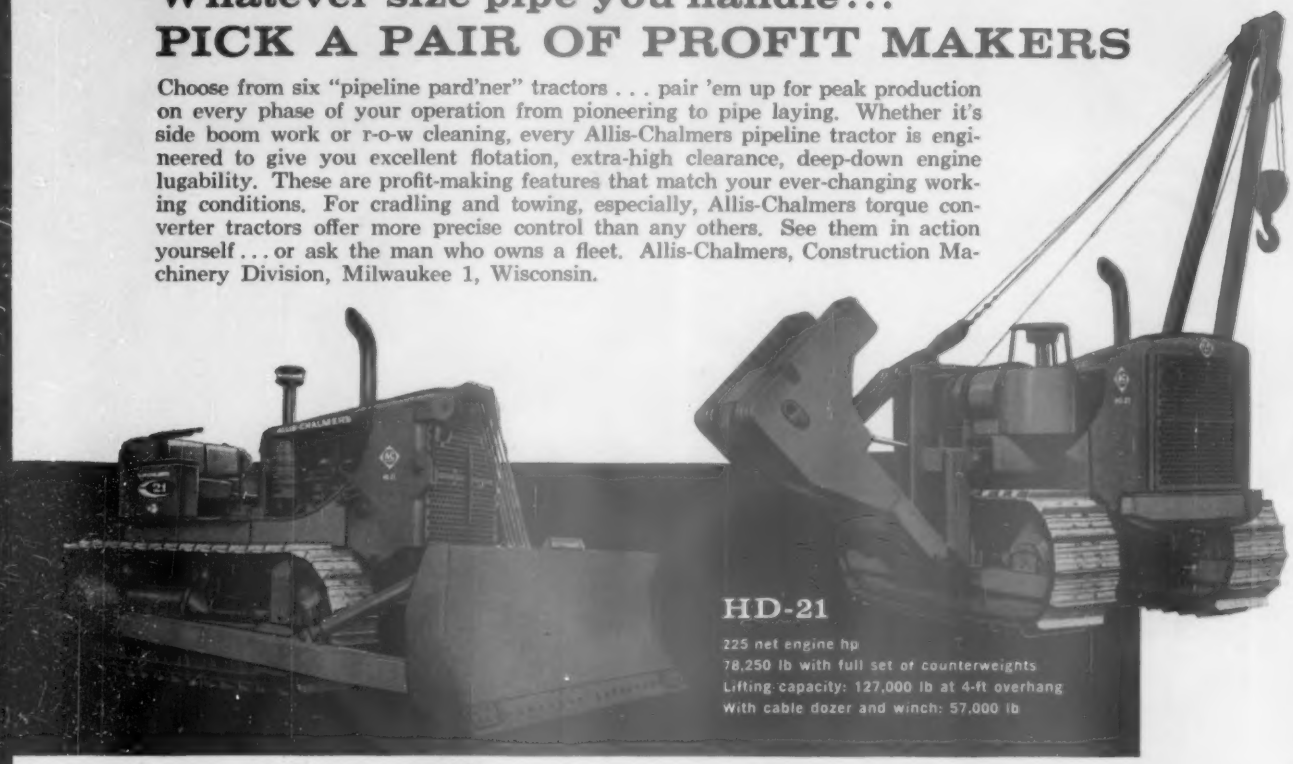
move ahead with **ALLIS-CHALMERS**

power for a growing world

Whatever size pipe you handle...

PICK A PAIR OF PROFIT MAKERS

Choose from six "pipeline pard'ner" tractors . . . pair 'em up for peak production on every phase of your operation from pioneering to pipe laying. Whether it's side boom work or r-o-w cleaning, every Allis-Chalmers pipeline tractor is engineered to give you excellent flotation, extra-high clearance, deep-down engine lugability. These are profit-making features that match your ever-changing working conditions. For cradling and towing, especially, Allis-Chalmers torque converter tractors offer more precise control than any others. See them in action yourself . . . or ask the man who owns a fleet. Allis-Chalmers, Construction Machinery Division, Milwaukee 1, Wisconsin.



HD-21

225 net engine hp
78,250 lb with full set of counterweights
Lifting capacity: 127,000 lb at 4-ft overhang
With cable dozer and winch: 57,000 lb

HD-16

150 net engine hp
59,010 lb with full set of counterweights
Lifting capacity: 78,000 lb at 4-ft overhang
With cable dozer and winch: 42,200 lb

HD-11

99 net engine hp
34,400 lb with full set of counterweights
Lifting capacity: 40,200 lb at 4-ft overhang
With cable dozer and winch: 27,500 lb

move ahead with

ALLIS-CHALMERS power for a growing world

LARKIN PACKER COMPANY

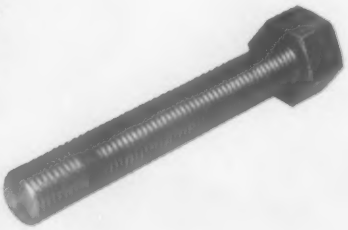
DIVISION KOEHRING COMPANY

WAXAHACHIE, TEXAS

LARKIN LEADERSHIP HAS BEEN EARNED BY YEARS OF DEPENDABLE PERFORMANCE

Don't Invite

The alert tool pusher protects his pumps against bogus parts. He knows that only authentic Gardner-Denver Parts—made by Gardner-Denver to Gardner-Denver specifications—provide full mud pump protection.



HIGH-STRENGTH STUDS

PRECISION
JUNK RINGS,
LANTERN SPACERS

GARDNER-DENVER
Since 1859

DON'T INVITE
INSIST ON QUALITY MUD

GARDNER

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Downtime

PROTECTION
against rig downtime and idle crews.

PROTECTION
against loss of capacity or efficiency.

PROTECTION
against sudden failure.

HARDENED AND POLISHED LINERS

SURE-FITTING VALVE COVER RINGS

DOWNTIME!
PUMP PARTS MADE BY
- DENVER

Petroleum Offices: Casper, Cleveland, Columbus, Corpus Christi, Dallas, Denver, Durango, Edmonton, Ellinwood, Evansville, Houston, Huntington, Jackson, Kansas City, Lafayette, Los Angeles, Mexico City, New Orleans, Odessa, Oklahoma City, Pittsburgh, San Francisco, Shreveport, St. Louis, Tulsa, Wichita, Winnipeg.

THE NEW LOW PRESSURE LINE WITH HIGH PRESSURE FEATURES

CMT and TH Heads

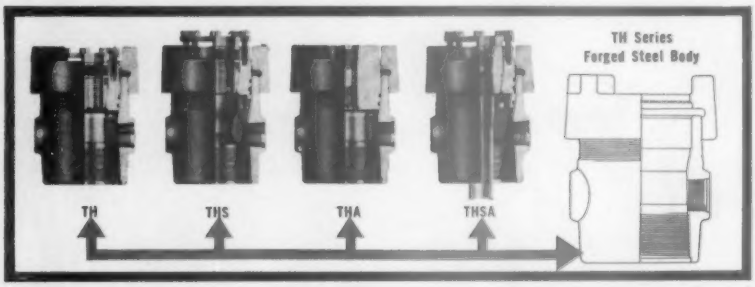
O·C·T Independent Well Heads

Bb will you look into this line? g.h.

New O-C-T independent (low pressure) CM Series casing heads and TH Series tubing heads hold down your well-head costs because they give you low first cost and maximum parts interchangeability. Their great versatility lets you produce a well to final depletion without expensive well-head changes. Forged steel construction gives you greater strength and reliability than is possible with cast or fabricated construction. O-C-T independent well heads also provide positive seals between strings, low silhouette, and ready adaptability to blowout preventers or other flanged heads.

O-C-T CM Series casing heads feature time-proved, wraparound slips for suspending the casing, and a simple, reliable, lip-type seal between strings. The two casing heads in this series, the CM and the CMT, are identical except that the CMT is equipped with a male-threaded adapter. This adapter has a secondary pack-off that seals around the inner casing and confines pressure to a minimum area. All sizes of CM Series casing heads are full opening to allow drill bits or centralizers to pass. Bottom connections are male threaded so that the heads can be screwed directly into casing collars.

CMT Head



All tubing heads in the TH Series use the same forged steel bodies, which are available for 4½-inch through 7-inch casing. The various hanger and stripper combinations shown above are interchangeable in this body and give the line its flexibility. They allow use of slips (TH), slips and a stripper (THS), a threaded hanger (THA), or a threaded hanger and a stripper (THSA). Standard API companion flanges can be used to attach blowout preventers. TH Series tubing heads are also available with flanged bottoms.

Write for our booklet "O-C-T Independent Well Head Equipment."

O·C·T

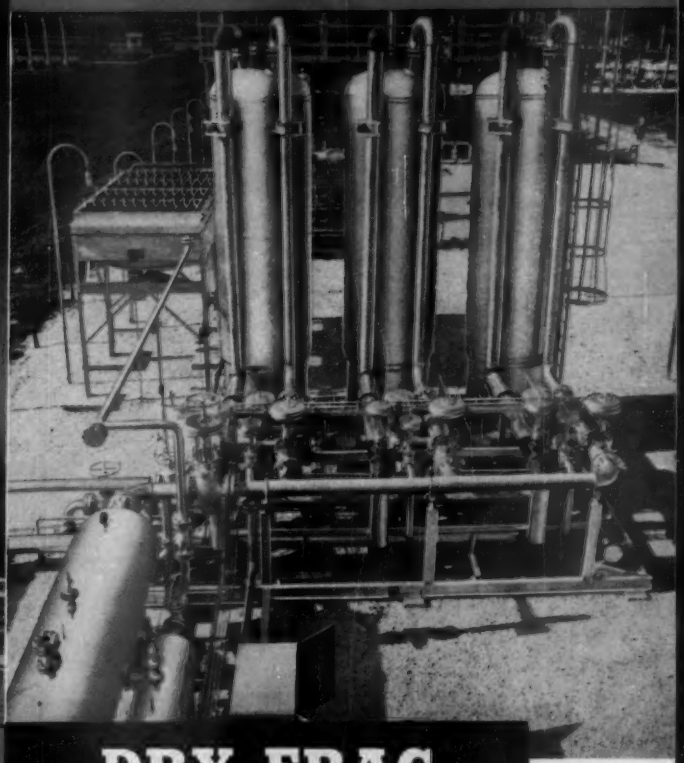
OIL CENTER TOOL CO.

SUBSIDIARY OF FOOD MACHINERY AND CHEMICAL CORPORATION

Address Export Inquiries for All Countries to P. O. Box 3091, Houston, Texas.

where progress is a daily practice

Rich Stream -- **Lean Stream**



COLD FRAC **DRY FRAC**

Different processes - one objective: PAYOUT!

Although the BS&B COLD FRAC and DRY FRAC processes and equipment are entirely different, both will dehydrate gas and recover hydrocarbon liquids while operating on an unattended basis. How, then, can you determine which process will give the best results for a specific application?

Generally, the COLD FRAC process is favored for use on a stream rich in C_5+ hydrocarbons. Variable design factors such as separation temperature, partial stripping of fluid, and balancing of the process to utilize equipment to its maximum capacity greatly affect the economics of this process, but it is not affected to any great degree by inlet temperature.

The DRY FRAC process is highly effective on streams with a low C_5+ GPM. Its efficiency is less affected than that of COLD FRAC by the composition of the wellstream, but it will recover a higher percentage of available pentanes from wellstreams of lean composition.

In addition to economic factors, there are other factors including flow rate, utilities, GPM, pressure and inlet temperature which should be taken into account before a selection of the process is made.

The important point to remember is that your BS&B Man offers a complete line of gas processing equipment, and is therefore in the best position to assist you in getting exactly the right equipment on your lease.

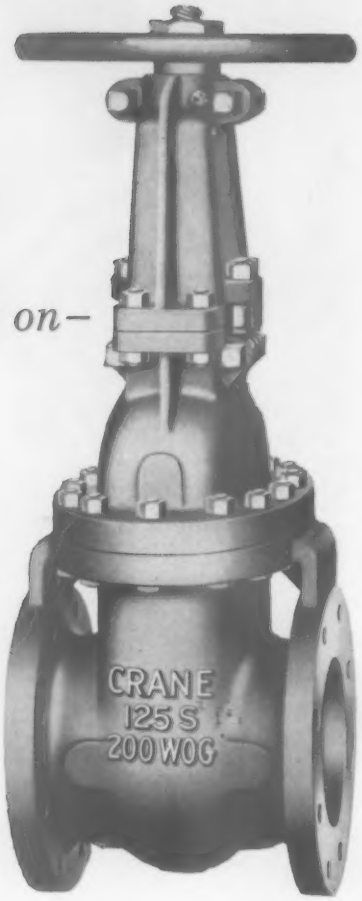
Ask your local representative for full information or write to Black, Sivalls & Bryson, Inc., Dept. 1-A12 P. O. Box 1714, Oklahoma City, Oklahoma.

BS&B — OVER 60 YEARS — ANOTHER EXAMPLE OF PRODUCT LEADERSHIP

BLACK, SIVALLS & BRYSON

OKLAHOMA CITY • EDMONTON • LONDON • PARIS • THE HAGUE

The valves most plants rely on–



No. 465½,
125-pound iron body
gate, bronze trimmed.
Sizes 2" to 48".

CRANE 125-POUND IRON BODY GATES

On general utility services . . . water mains and distribution lines . . . low-pressure steam and hot water . . . air and gas . . . more plants rely on Crane No. 465½ iron body bronze trimmed gates than on any other valve in this class.

Crane iron gates are an up-to-date design with service-proved features. A two-piece, ball-type packing gland for bind-proof packing adjustment . . . shoulder-type seat rings that won't loosen . . . extra-long disc guides to minimize drag on seating faces. All features are carefully planned to yield long, dependable operating life.

To enable you to standardize on these economical, efficient valves, Crane builds them in a full range of sizes. Popular sizes are available from local stocks of your Crane Distributor.

CRANE®

Crane Co., Industrial Products Group, 4100 S. Kedzie Ave., Chicago 32, Illinois

VALVES • ELECTRONIC CONTROLS • PIPING • PLUMBING • HEATING • AIR CONDITIONING

Tons of iron ore turned into molten pig iron and from this ... steel. From research have come steels that can withstand the most intense heat and cold ... steels that will help man conquer space.

there's more to Cities Service than meets the eye!

It takes 523,451 men and women ... far-reaching exploration teams, transportation systems, testing and research labs to produce the steel we use. America produces more than 85 million net tons of steel each year to meet the demands of consumer and industry. Yet few of us ever think of all that goes into manufacturing this "everyday" metal.

And few of us pulling into the green-and-white Cities Service station to "fill her up" realize all that lies behind today's quality gasolenes. Cities Service uses a pipeline system that could circle the globe. We search five continents for oil and maintain the most modern research laboratories and refineries.

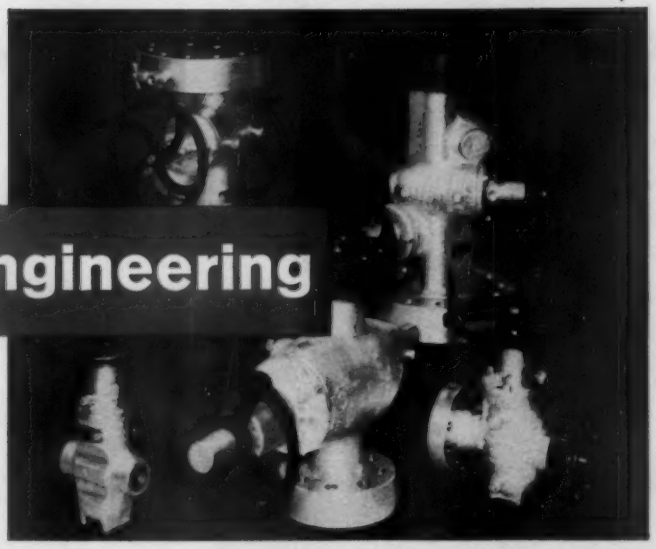
Cities Service has invested over a billion dollars in product improvement and development. The challenge of tomorrow requires even greater investment.

Only in this way can America have what it needs for progress—more jobs and more and better oil products.

CITIES SERVICE

CITIES SERVICE COMPANY 50th ANNIVERSARY

NOW



Top left to right: Integral Dual Completion Gate Valve; Integral Triple Completion Gate Valve. *Bottom left to right:* Recessed Body Gate Valve for Triple Completions; Balanced Stem Gate Valve; Standard Production Gate Valve.

Valves designed for fast on-line overhaul prevent major production losses

In many installations, W-K-M Gate Valves have *never* needed overhaul. But when repair *is* needed, W-K-M Valves are designed so *any* internal part—packing, stem, gate or seats—can be easily replaced while the valve is *on the line.*

And even under high pressure, W-K-M Valves permit many repairs which can not be made to other valves without lengthy shutdowns.

Far-sighted design that protects you against such eventualities is an important part of TOTAL Valve Engineering—W-K-M's unique dedication to *all* phases of valve technology. It's one reason why W-K-M Valves are world-renowned for helping prevent production losses!

W-K-M

DIVISION OF ACF INDUSTRIES
INCORPORATED
P. O. BOX 2117, HOUSTON, TEXAS

6005

HOLDS LOAD "RIGHT THERE"

SMOOTHER THAN STEAM

DRILLED OVER 22,000 HOURS AND STILL GOING STRONG

Run a torque converter on a drilling rig for over 22,000 hours without laying a wrench on it and your profits are bound to look good. Right?

You can bet they will – for you'll not only save money on repairs, but on lost drilling time too.

And that's exactly what Crow Greyhound Drilling Company of Shreveport, La., is doing by using TORQMATIC Converters on three of its drilling rigs. The converters on one rig have racked up more than 22,000 hours of trouble-free service. In all that time, *the only thing Crow Greyhound Drilling Co. did to the converters was normal preventative maintenance.*

But it's not just TORQMATIC's trouble-free performance that's saving money for Crow Greyhound Drilling Co. They're also drilling faster, making faster round trips, spending less on rig maintenance because of the "smoother than steam" power transmission. Inch-by-inch control saves time on fishing jobs–and drill strings last longer with TORQMATIC absorbing the shocks.

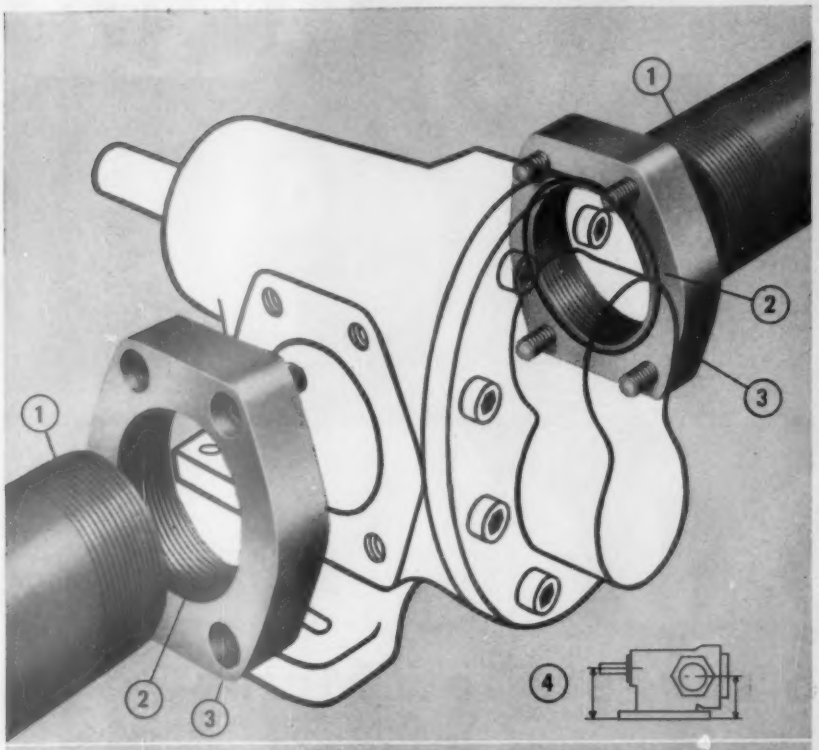
You can make more–save more–with TORQMATIC DRIVES working for you on your drilling, fracturing, or servicing jobs. They're available from most leading oil field equipment manufacturers. See your dealer for details, or write Allison Division, General Motors, Indianapolis 6, Indiana. In Canada: General Motors Diesel Limited, London, Ontario.

Allison

TORQMATIC® DRIVES

THE MODERN DRIVE FOR MODERN EQUIPMENT

Now from Brown & Sharpe...

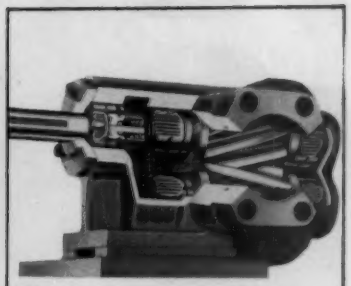


1 Standard threaded pipe connections fit 2", 3" or 4" pipe directly, without extra fittings. Plain pipe flanges optional.

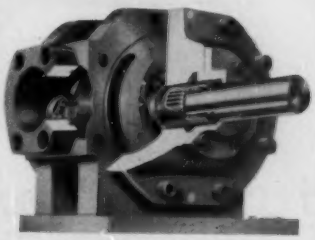
2 Inlet and outlet are same size.

3 Replaceable pipe flanges. Can be quickly changed to eliminate pump replacement caused by damaged threads.

4 Mounting dimensions help assure convenient replacement of other pumps.



New B&S "300" series rotary gear pumps. For pressures to 300 psi; caps. of 40, 60, 90, 125, 175 gpm.



New B&S "700" series geroter pumps. For pressures to 1000 psi; caps. of 20, 30, 40, 60, 80 gpm. (Note: This highly-efficient design has unusually long service life, because contact between its inner and outer elements progresses at only 1/9 driven speed.)

a brand new line of rotary pumps with 4 big advantages for low-cost installation

You save on maintenance and get longer life, too

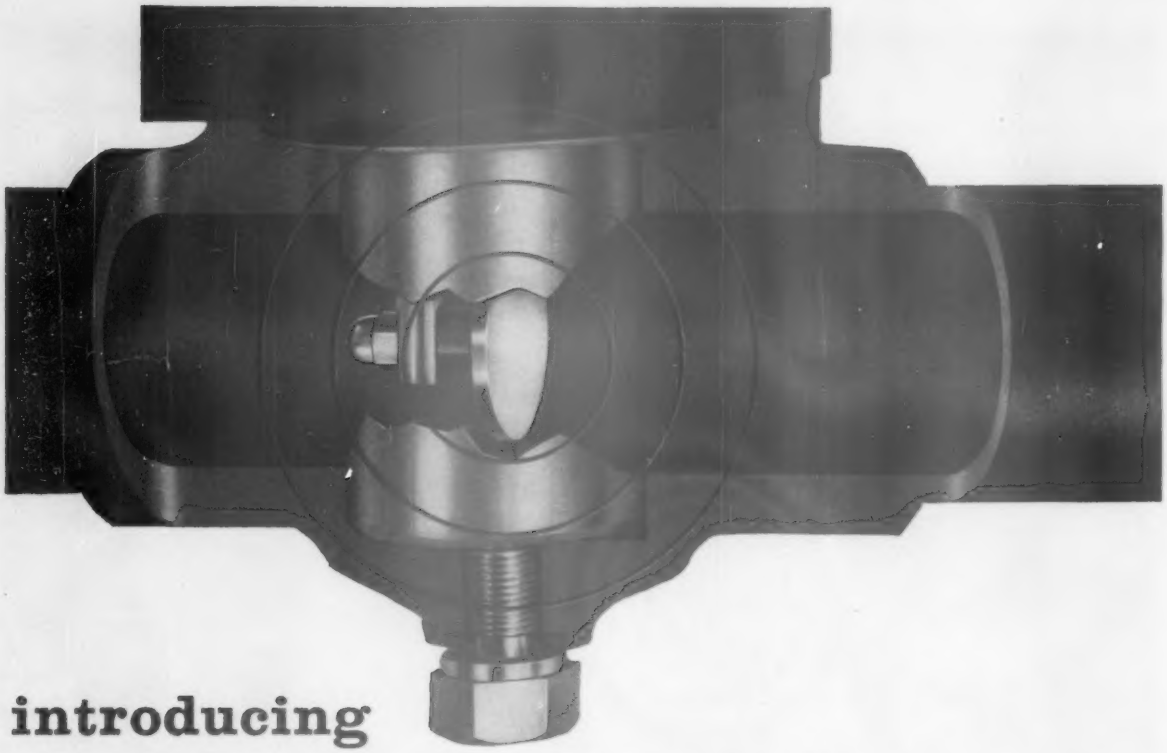
These new B&S rotary pumps are designed specifically for the Petroleum Industry.

They are constructed simply, with standard bolts and screws, for easy maintenance. They are equipped with roller bearings and replaceable wear plates, for extra-long service life. They save you money right down the line.

Rugged field tests have proven these pumps every bit as efficient and reliable as intended.

To start saving money on pumps, contact your oil field supply house about new Brown & Sharpe pumps. Ask them for a catalog, or write: Hydraulics Div., Brown & Sharpe Mfg. Co., Providence 1, Rhode Island.

Brown & Sharpe PRECISION CENTER



introducing the Foxboro Target Flow Meter

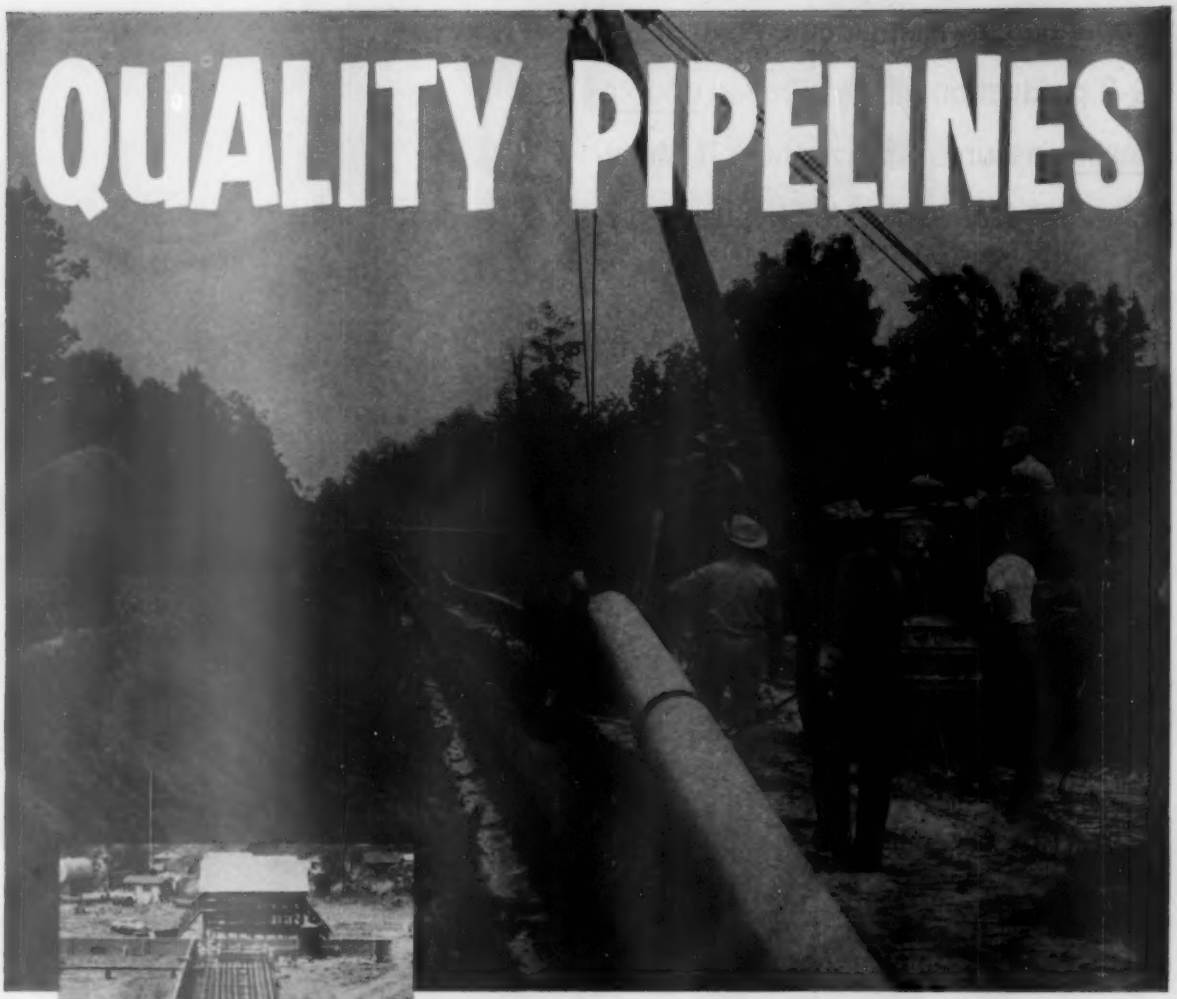
new, improved way to measure the "tough ones" ... heavy oils and viscous liquids to 750° F— installs directly in line... no pressure taps to foul or plug up—high repeatability—low maintenance—write for TI 37-84a, or contact your Foxboro Field Engineer.

FOXBORO
REG. U. S. PAT. OFF.

THE FOXBORO COMPANY
6012 Neponset Ave., Foxboro, Mass.

The Foxboro Target Meter is installed directly in the flow line. A stainless steel "target," extending into flow stream, senses mechanical force of fluid pushing against it. Force is then converted to a pneumatic signal and transmitted to a remote recorder or controller.

QUALITY PIPELINES



Another fine service of *LATEX* is the construction of MARINE & PIPELINE TERMINALS. *LATEX* offers personnel skilled in this phase of the industry.

LATEX QUALITY LINE CONSTRUCTION

LATEX offers line construction of the highest caliber. This statement is backed up by more than one quarter century service to the oil and gas industry. Repeating Business has been the keynote to success of this growing company. For your next quality line invite *LATEX*.

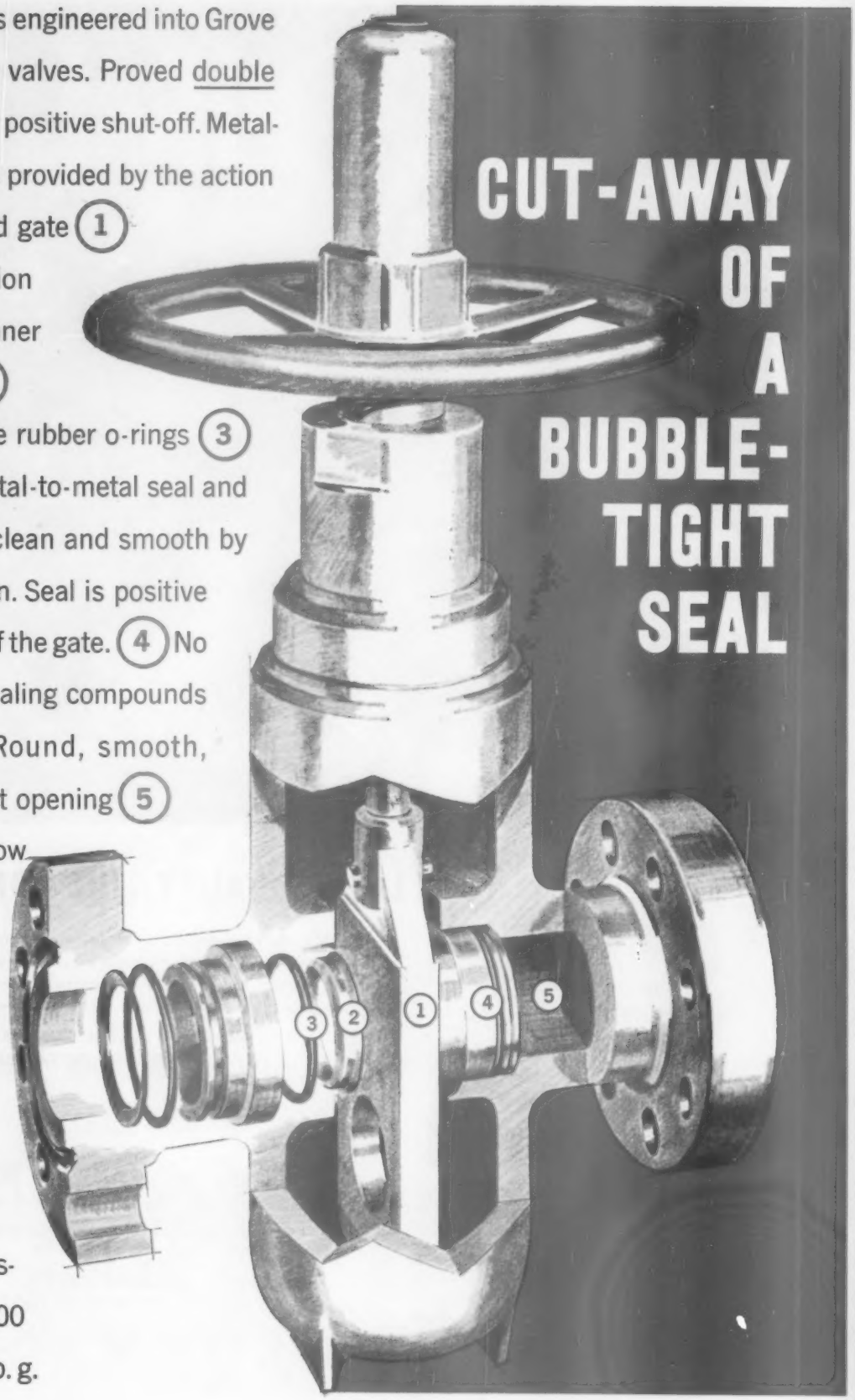
REMEMBER, LATEX QUALITY CONSTRUCTION BRINGS REPEAT BUSINESS

LATEX
SERVING 1/4 CENTURY

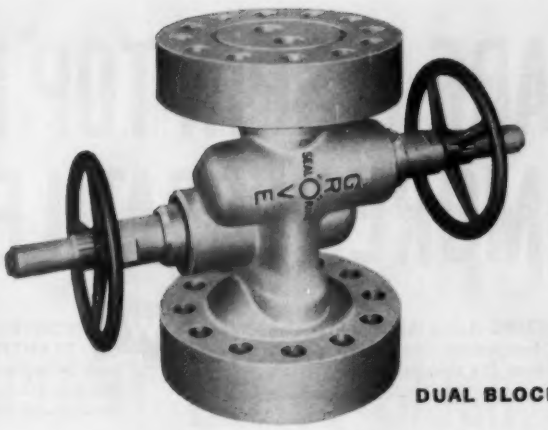
LATEX CONSTRUCTION COMPANY

P. O. BOX 12128 · ATLANTA 5, GEORGIA · CE 3-9414

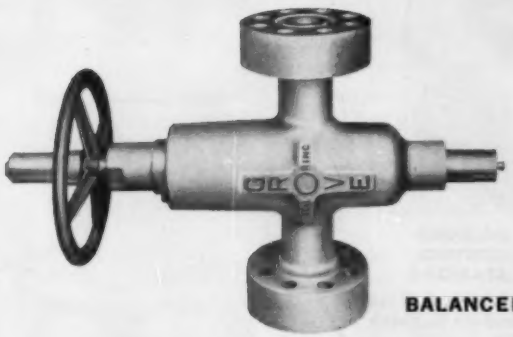
Dependability is engineered into Grove G-2 production valves. Proved double sealing assures positive shut-off. Metal-to-metal seal is provided by the action of parallel sided gate (1) against precision ground metal inner seat rings. (2) Protected nitrile rubber o-rings (3) back up the metal-to-metal seal and keep the gate clean and smooth by squeegee action. Seal is positive on both sides of the gate. (4) No lubricants or sealing compounds are needed. Round, smooth, through conduit opening (5) assures ideal flow characteristics and freedom to pass tools. Available also in dual block, balanced stem and recessed body types. Pressures from 1,000 to 10,000 # w. o. g.



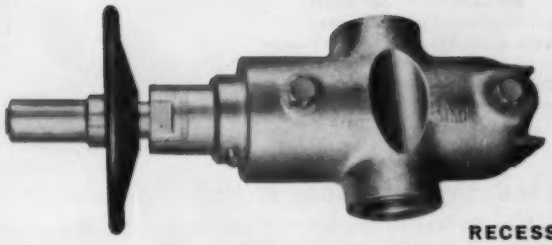
GROVE G-2 SEAL-"O"-RING GATE VALVES FOR PRODUCTION AND FLOW LINE SERVICE



DUAL BLOCK



BALANCED STEM



RECESSED BODY

GROVE PRODUCTION VALVES

GROVE VALVE AND REGULATOR COMPANY

a subsidiary of Walworth

Oakland 8, California

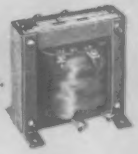
Offices throughout the U.S. and in Western Canada

SQUARE D SPIN TOP® ENCLOSURE NOW MORE VERSATILE THAN EVER!

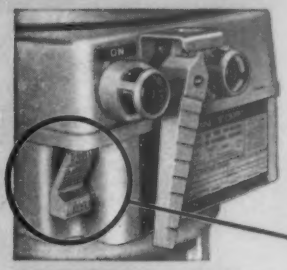
DAMAGE-RESISTING Acme threads. If you've struggled with "banged-up" threads, you'll appreciate this feature. It's always a breeze to put on and take off tanks for installation, inspection or maintenance.

FULL WEATHER PROTECTION - Male threads on collar engage female threads on tank—no external threads to be damaged.

NEW! **CONTROL TRANSFORMER** can be mounted in collar. No special-length tanks required.

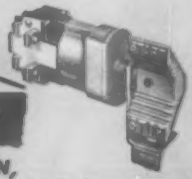


INCREASED WIRING SPACE - Four conduit openings standard, with through-feed conduit entrances for horizontal tap-offs optional.



NEW! **SELECTOR SWITCH** is made in one piece, installs simply by threading into opening provided in enclosure. One-piece construction permits pre-testing before shipment.

NEW! **RECESSED CONTROL STATIONS** like the reset button are out of the way, have no protrusion to break or bend accidentally.



NEW! **PUSHBUTTON,** like the selector switch, features one-piece construction for easy installation. Heavy-duty contacts and rugged mechanism assure long life.

NEW! **BRILLIANT PILOT LIGHT** is visible from all angles and provides easy bulb change. Enclosure available with either one or two factory-mounted lights or can be furnished with plugged holes for field installation. Stainless steel thread-in-thread construction gives corrosion-resistance and easy servicing.

EASY TO INSTALL with *slide and hook* mounting arrangement for interior equipment—a Square D "exclusive." Takes the hard work out of the installation job.

STRONG AND LIGHTWEIGHT construction. Complete enclosure is cast aluminum. All operating shafts are stainless steel, thread-in-thread, for the best in corrosion resistance.

Square D *is Better in So Many Ways!*

When you buy from Square D, you not only get all the benefits shown above—you also are buying from the only manufacturer who builds both the enclosure and the starter, giving you unit responsibility. Moreover, Square D offers better stocks, better on-the-spot service. That's why it makes sense to insist on Square D Spin Top enclosures for your hazardous location applications.

4 ENCLOSURE SIZES ACCOMMODATE NEMA SIZES 0 THROUGH 5

Square D Spin Top enclosures are NEMA 3 (weatherproof), NEMA 4 (watertight), NEMA 7 (explosion-proof) and NEMA 9 (hazardous locations) for Class I, Group C and D; and Class II, Groups E, F and G service.

Write for Bulletin 9990. Square D Company, 4041 North Richards Street, Milwaukee 12, Wisconsin

SQUARE D COMPANY

wherever electricity is distributed and controlled

YOUR DRILLING DOLLARS GO FURTHER WITH

..FIELD PROVEN

CONTINENTAL-EMSCO "D" Series Slush Pumps

No *wasted* dollars here. Low weight of these pumps cuts transportation costs . . makes them easier to handle around the rig for faster spudding-in. Lightweight steel plate construction replaces bulky, heavy castings.

Maintenance downtime is greatly reduced. Daily adjustments are not necessary. Lubrication is completely automatic, and greasing is not required. Patented "exposed" liner design helps prevent liner washouts, since packing leaks can be spotted immediately . . long before damage can be or has been done.

Seven models help cut initial investment by providing a range of sizes to meet all drilling conditions at the lowest possible cost.

High performance of "D" Series pumps . . proved by years of drilling in the oil fields of the world . . assures penetration at its fastest rate.

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Memo to Management:

TO PUMP
OR NOT TO PUMP ***EFFICIENTLY***
IS THE QUESTION
and PEPA has the answer

The question of dependable, efficient power for oil field pumping has been answered time and again with economical utility electric power. In most instances there is no substitute for the savings in maintenance, money and manpower provided through the use of purchased electric power. And this record of efficiency is not restricted to any one section of the petroleum industry. From the oil fields to the refinery it will pay you to investigate possible savings you may derive. Contact your Utility Electric Power Company for details.

A list of P.E.P.A. members will be furnished on request

PETROLEUM POWER ELECTRIC ASSOCIATION

BOX 35006, DALLAS 35, TEXAS

Planning a tank battery hookup soon?

Get your choice of connections at National Supply

Complete choice of tank battery hookup components is yours at the nearby National Supply store. The typical store shelves illustrated above show the ready availability of Victaulic grooved fittings and Larkin swage nipples and bull plugs. Equally available are other famous products for tank battery hookups—Rockwell valves, Weco unions, Tube Turns welded connections and Stockham fittings, to name a few.

Similar choice ranges are available for *all* your oil country supply needs. National Supply purchases equipment and supplies from literally thousands of different sources, every one a leader in its field. Next time you buy supplies, take advantage of this complete variety by calling National Supply.

See next pages for Sucker Rod Information

Now! National Supply offers Sucker Rod

National Supply now has a complete line of six rod grades to meet every well condition from non-corrosive to highly corrosive salt water and sulphide. Recommended application for each of the six grades is shown in the selection chart below.

A new high strength Grade 45 sucker rod rounds out this National Supply line. It is recommended for wells where there is little or no corrosion and where heavy loads are encountered.

One big reason for buying National Supply rods is the advanced way they are packed and handled to make sure they reach you in factory perfect condition, ready to be run in the well.

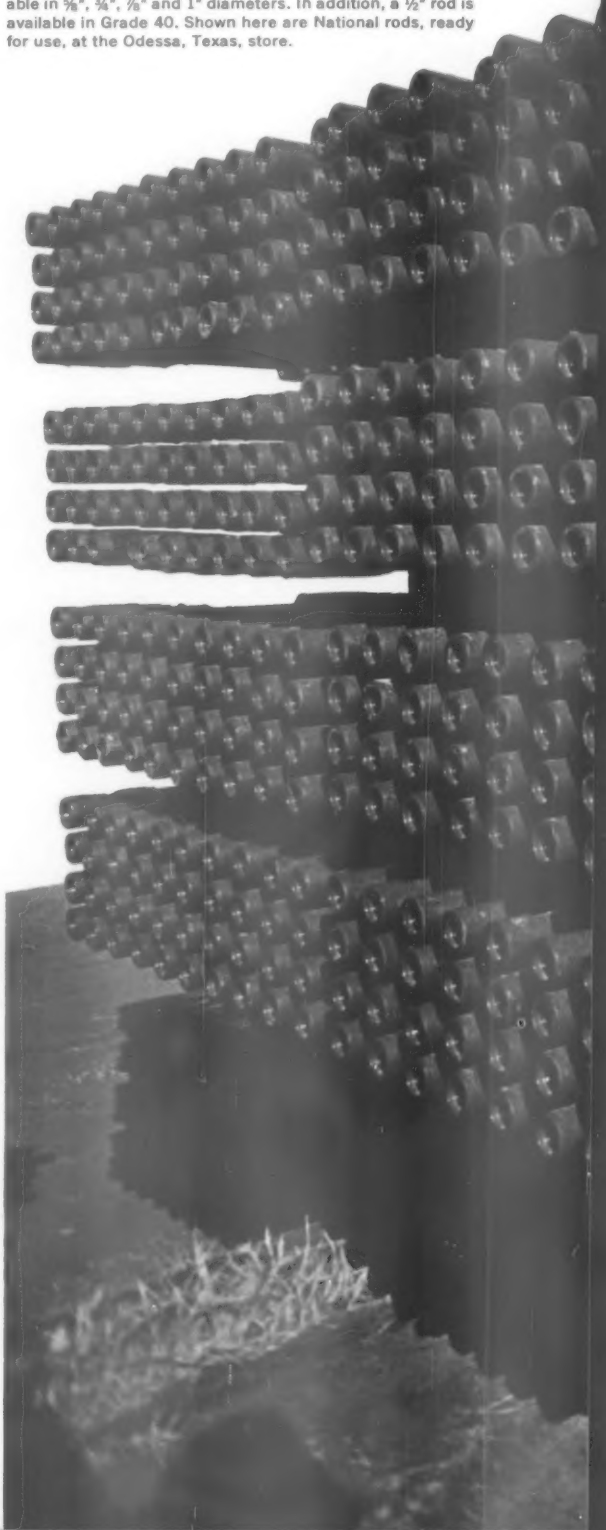
First step in packing National Supply rods is to place each one in a separate groove on the pallet. Each package is firmly secured with five steel straps to prevent movement. Anti-slip brackets prevent lateral slippage of packages.

All lifting, both at plant and by customer, is facilitated by use of special lifting rods and cables that are shipped in place. After sucker rods are carefully loaded on the flat car, they are fully secured by heavily braced bulkheads to guard against shifting in transit.

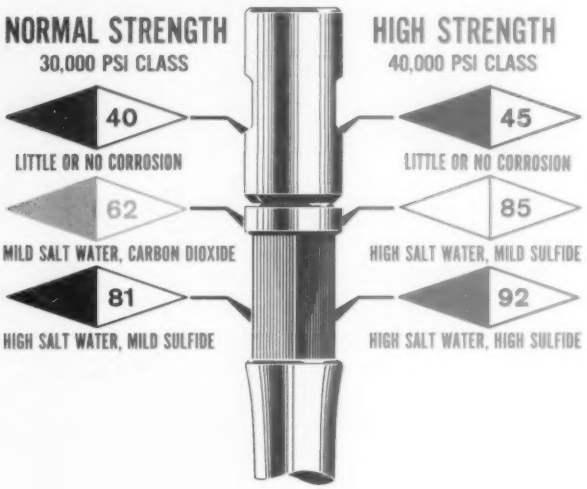
This careful packing and shipping control typifies the utmost quality control that National Supply exercises throughout the manufacturing process. End result is the ultimate in uniformity, dependability and economy.

Now is the best time to review your sucker rod needs with your National Supply representative. It'll pay to call him today.

National Supply sucker rods always reach you in factory perfect condition. All National Supply rods are readily available in ⅝", ¾", ⅞" and 1" diameters. In addition, a ½" rod is available in Grade 40. Shown here are National rods, ready for use, at the Odessa, Texas, store.



Sucker Rod Selection Chart



grades to meet every well condition

Steel's Symbol of strength, long life, and economy

Complete downwell pump servicing facilities are available through your National Supply stores.

Need fast service on a downwell pump?

Fast, economical maintenance is a reality when you consistently use National Supply's downwell pump service.

All repairs are handled promptly by qualified personnel in well equipped, strategically located pump service shops.

National Supply pump shops have large stocks of repair parts and are ready to serve your needs without delay.

If you need new pumps, your nearby store has complete stocks of famous Oilmaster pumps and can fill your order immediately. Quality-wise, Oilmaster pumps are definitely superior. They are manufactured under stringent quality controls by the Fluid Packed Pump Company, a division of National Supply. Thus, pump servicing and new pump recommendations are backed up by the know-how and skills of the original manufacturer.

You'll find it pays to call National Supply next time you need new pumps, or service work on your present pumps.

THE NATIONAL SUPPLY COMPANY

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You save drilling dollars with a Baroid Mud Program

THE MUD PROBLEM AND ITS SOLUTION

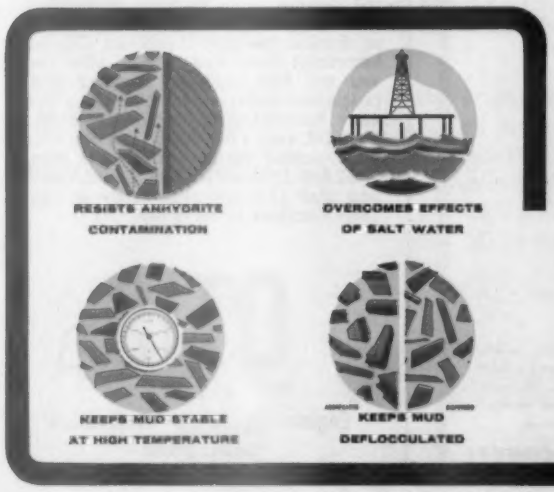
Q-BROXIN*

When your drilling problem is to reduce viscosity and gels in salt, gyp or fresh water muds, Q-BROXIN is your answer.

For example, in a complete Baroid mud program used on a well in Timbalier Bay Field, Lafourche Parish, Louisiana, a Q-BROXIN — bay-water mud was successfully maintained in spite of salt water flows and adverse shale conditions. The total mud cost was only half that of wells to similar depths. Over 14,000 feet of 9⅝" casing was set and cemented without difficulty.

Q-BROXIN mud treatment controls flow properties in the presence of calcium and chloride contamination and such muds are stable at high temperatures. Inhibited muds are easy to control with Q-BROXIN.

A Baroid mud program *is planned* to give *you* drilling success and *save your drilling dollars.*


RESISTS ANHYDRITE CONTAMINATION
OVERCOMES EFFECTS OF SALT WATER
KEEPS MUD STABLE AT HIGH TEMPERATURE
KEEPS MUD DEFLOCCULATED

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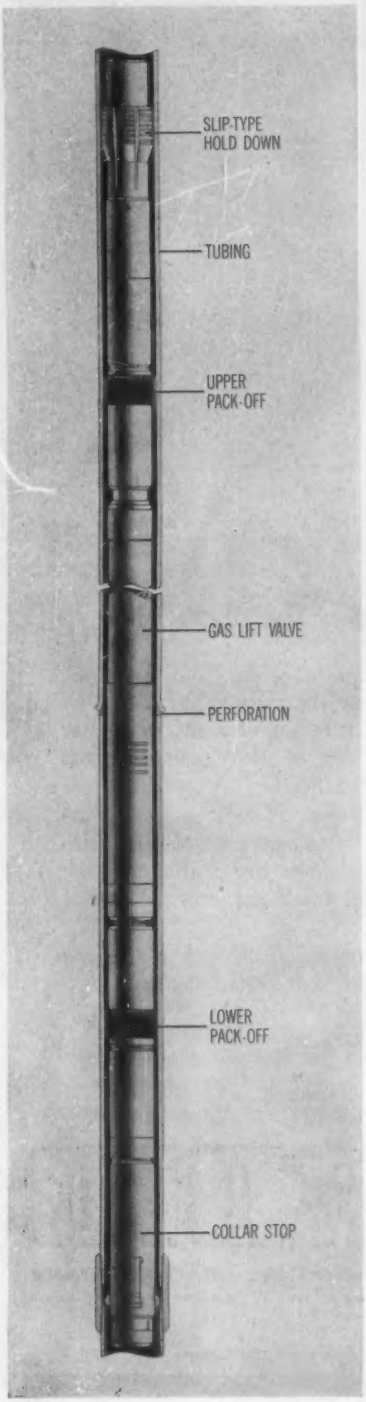
6030

OTIS PRODUCTION NEWS

Volume II, Number 3 **Otis Engineering Corporation • Dallas** *Production Equipment and Services*

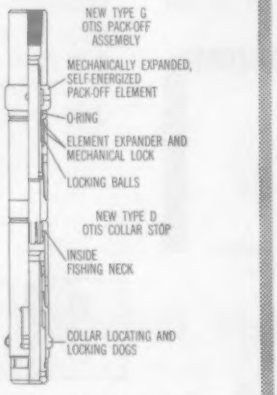


Cost-Conscious Producing Companies Endorse Otis All Wire Line Technique Of Converting Wells to Gas Lift

CORPUS CHRISTI—Eliminate the cost of a pulling unit to round-trip tubing when converting a well to gas lift and you can save an impressive amount of money per well. That's what several of the major producing companies in this area discovered when they started using the new Otis "All-Wire-Line" Gas Lift Conversion Technique.

A spokesman for one of these majors recently stated that his company is most enthusiastic about the technique — especially for water locations — because "(1) it's faster, (2) it's less expensive, (3) it's every bit as efficient as other types of installations they have made, and (4) it eliminates the risk of damage to the producing formation from contamination by mud and/or water in the annulus." Another company reported a savings of $60,000 in converting three, readily accessible, land locations.

As an example of how the technique can reduce the cost of a conversion, take a look at the following case history: A 6800-foot well located in approximately three feet of water in the Copano Bay Field ceased to flow naturally and was scheduled to be put on gas lift. In making plans to have the work done, it was discovered the approach canal had filled with silt and sand, which meant an expensive dredging operation would be necessary before a barge-mounted workover unit could be moved onto location; cost of a workover unit would be $1400 per day, and the annulus was loaded with old drilling fluid. Estimated conversion costs were mounting fast. A conference with the Otis Gas Lift Specialist in the area convinced the operator he should try a Type CG Otis Pack-Off Gas Lift Valve installation.


NEW TYPE G OTIS PACK-OFF ASSEMBLY
MECHANICALLY EXPANDED, SELF-ENERGIZED PACK-OFF ELEMENT
O-RING
ELEMENT EXPANDER AND MECHANICAL LOCK
LOCKING BALLS
NEW TYPE D OTIS COLLAR STOP
INSIDE FISHING NECK
COLLAR LOCATING AND LOCKING DOGS

Straight through, full opening bore of pack-offs, collar stop, and gas lift valve permits maximum production with minimum turbulence.

©1960 O.E.C.

After setting a circulating plug in the tubing at the spot indicated for the lowermost valve, perforating and circulating mud from the annulus, it took the trained Otis Wire Line Specialist only 15½ hours of wire line time to perforate and install five concentric Type C Gas Lift Valves between Type G Otis Pack-Off Assemblies and have the well ready to be put back on production. Eight months following the conversion, the well was still making its allowable in an economical and efficient manner. And to attest to the reliability of the new Type G Otis Pack-Off Assemblies, the well was being produced from the lower-most valve.

Otis Gas Lift and Completion Specialists are interested in helping you find a way to complete and produce your wells in the most efficient manner. The experience these men have accrued throughout the years is yours to draw from when faced with any down well completion or production flow control problem. Use the knowledge these men have to offer and you will find you'll be spending your production dollars more efficiently. For more information on the Type CG Otis Pack-Off Gas Lift Valve, call the Otis office nearest you or write Otis, Dept. 3-W, Box 35206, Dallas 35, Texas. You'll find your Otis specialists ready to help you — anxious to serve you.

OTIS

Engineering OTIS Corporation

General Offices:

6812 Denton Drive • Dallas, Texas

SAVE ON SLIM HOLE MULTI-ZONE COMPLETIONS

SOUTHWESTERN INTEGRAL-JOINT TUBING

Quality-engineered Southwestern tubing is designed and manufactured for maximum economy in slim hole and multiple completions. Southwestern integral-joint tubing conforms to applicable parts of API 5A standards and is interchangeable with API 10Rd. non-upset tubing. To meet your drilling requirements, a wide range of sizes is available up to and including 3.500" casing. Write for our new brochure . . . it gives complete specifications.

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They Say—

First-Class Issue

Dear Sir:

Your pilot number of Oil and Gas International is unexcelled in publishing idea, and will be of tremendous practical value to oil men.

When I am giving you my opinion on your "youngster" I may mention that I feel competent doing it because I am in the oil industry since 1905. During this long period of time I was (with exception of the two world wars when we Europeans had no access to it) not only a reader of your Journal, but a real student of it.

I always feel an indebtedness to the creators of your publications. That's to be said about your Journal . . . and how can your International not be on the same high level?

Congratulations to your editors on this outstanding accomplishment.

Paul P. Prandstetten
Chairman of the
Supervisory Board
Mobil Austria A.G.
Vienna

Editor's note: Petroleum Publishing Co.'s newest publication, Oil and Gas International, will officially appear in January. A pilot issue, using material in the Journal's "Oil and Gas International, a Special Report," (OGJ, Oct. 31, p. 76) was printed in October.

Dear Sir:

We recently received with great interest your pilot issue and feel that this publication would be of much more use to us than some of the other publications to which we are subscribers.

Accordingly we should be pleased if you would place us on your subscribers' list starting with the first regular issue in January 1961.

D. S. Smith, Secretary
Weir Valves, Ltd.
Glasgow

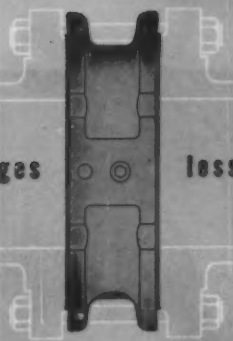
Dear Sir:

Mistake! Facing page 1 in the Oil and Gas International house box, "St. Jame's" should read "St. James's."

But seriously, Oil and Gas International is first class and all of you (especially the man who got the 12-page supplement from Goodyear!) are to be congratulated. And I add mine/ours to all the others.

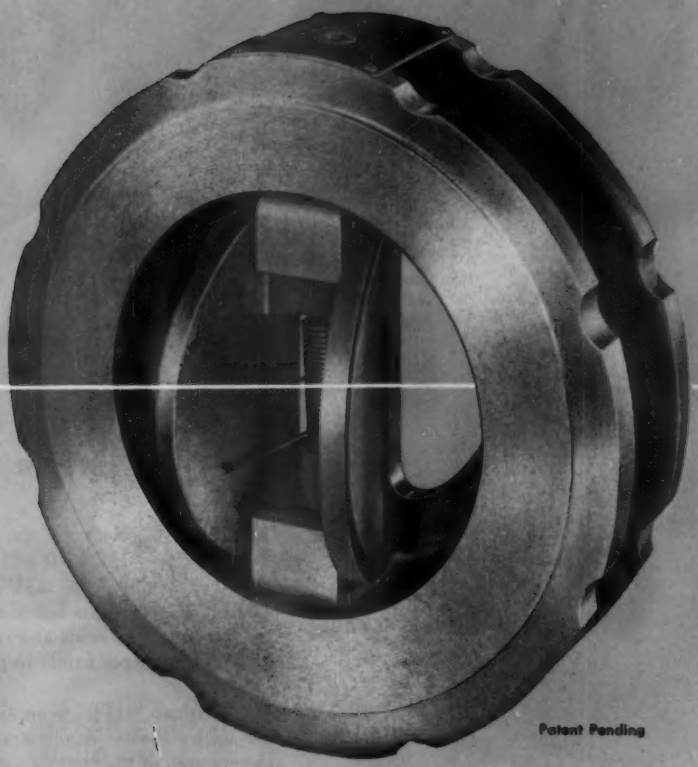
A. Twist
Burmah Oil Co., Ltd.
London

Editor's note: Mr. Twist refers to



fits between the flanges

less space—weighs only 10% as much



Patent Pending

Mission Duo-Chek valves

Mission Duo-Chek Valves weigh approximately 10 per cent as much as conventional check valves. Smaller, lighter Duo-Chek Valves mean that you save on space, weight, installation, and price. But, you are getting a check valve with a bubble-tight seal, anti-slam closure, long life built in. No load is carried on the plate hinges. No external parts. No lubrication required.

The sine wave seal prevents seepage, yet holds without leaking or distortion at maximum test pressure. The sealing material is molded and bonded into a metal groove, making an "O"-ring type seal. Pressure deforms the packing. Metal-to-metal contact completely encloses the sealing material, preventing pinching off under pressure. Available in steel, 316 stainless, aluminum, and bronze to fit ASA raised face or ring joint flanges.

MISSION MANUFACTURING CO. P. O. BOX 4209, HOUSTON, TEXAS • CABLE ADDRESS "MISSCO"
EXPORT OFFICE: 30 ROCKEFELLER PLAZA, NEW YORK • In the United Kingdom: MISSION MANUFACTURING CO., LTD., 1 Hanover Square, London W. 1 England • cable address "MISSOMAN"

MISSION MANUFACTURING CO.

66—101

Plasticap "HTP" stops corrosion

Because the pipe at left is coated with Plasticap "HTP," it will never look like the corroded pipe above. Plasticap "HTP" provides excellent protection from corrosion. This baked-on plastic coating gives you lasting resistance to acids and caustics, even at temperatures above 350°F. It adheres firmly to pipe surfaces, does not chip, crack or peel.

Plasticap "HTP" is applied by precisely controlled processes developed by Plastic Applicators, Inc. The quality standards maintained at every step of the coating process, from pipe cleaning to baking, assure you that Plasticap "HTP" will give your pipe long-lasting protection.

For a complete laboratory test report on the resistance of Plasticap "HTP" to all types of corrosion, write:

PROTECT YOURSELF AND YOUR PIPE. SPECIFY PLASTICAP. MORE TUBULAR GOODS ARE PROTECTED WITH PLASTICAP THAN ANY OTHER COATING.

Plasticap
PLASTIC APPLICATORS, INC.
REGD. T.M.

Main Office: 7020 Katy Road, P. O. Box 7631, Houston, Texas, UN 9-3611. **Plants:** Harvey and Morgan City, Louisiana. Houston and Odessa, Texas. **Sales Offices:** Midland, Dallas, and Corpus Christi, Tex. Hobb, N.M. Tulsa, Okla. Houma, Lafayette, New Orleans, and Shreveport, La. Jackson, Miss.

the masthead in the pilot issue of Oil and Gas International.

Eyewitness report

Dear Sir:

May I compliment you on the thorough reporting done on the API convention at Chicago this year (OGJ, Nov. 21, pp. 121-142). I was there. I find the reporting excellent and thorough.

Paul B. Shivel
Vice President, Production
Petroleum, Inc.
Wichita

Bad from every angle

"On a short-term basis, reduced profits force intensified cost reduction campaigns, disruptions in operations, and, eventually, layoffs.

"On a long-term basis, a profit squeeze reduces the incentive for investors to risk their money, thereby discouraging the industrial expansion and growth that result in new jobs and new products."

Article in the Sabine River News, newspaper of Du Pont Co.'s Sabine River Works, Orange, Tex.

Letters to They Say should be addressed to The Editor, The Oil and Gas Journal, Box 1260, Tulsa, Okla.

CALENDAR OF EVENTS

DECEMBER

26-31 American Association for the Advancement of Science, annual meeting, New York City.

JANUARY

15-18 Pipe Line Contractors Association, annual meeting, Mark Hopkins and Fairmont Hotels, San Francisco.

16-19 Instrument Society of America, winter instrument-automation conference and exhibit, Sheraton-Jefferson Hotel and Kiel Auditorium, St. Louis.

17-19 Kentucky Petroleum Marketers Association, annual meeting and convention, Brown Hotel, Louisville.

18 Institution of Mechanical Engineers (Great Britain), symposium on pressure vessel research toward better design.

20 Natural Gasoline Association of America, Gulf Coast regional meeting, Robert Driscoll Hotel, Corpus Christi, Tex.

22-24 Kansas Oil Men's Association, annual convention, Broadview Hotel, Wichita.

24-27 Society of Plastics Engineers, seventeenth annual technical conference, Shoreham Hotel, Washington, D. C.

30-Feb. 9 University of Illinois, annual quality control short course, Urbana, Ill.

FEBRUARY

7-8 University of Oklahoma, School of Petroleum Engineering, advanced petroleum engineer seminar, University of Oklahoma, Norman.

8-10 Southwestern Legal Foundation, twelfth annual institute on the law of oil, gas, and taxation, Southwestern Legal Center, Dallas.

14-15 National Association of Corrosion Engineers, Shreveport, La., section, short course, Centenary College, Shreveport.

15-16 Western Petroleum Refiners Association, Gulf Coast regional technical-industrial relations meeting, Robert Driscoll Hotel, Corpus Christi.

18 Purdue University, business history conference, "Management Decisions Under Government Regulation," Memorial Union, Purdue University, Lafayette, Ind.

24 Natural Gasoline Association of America, South Louisiana regional meeting, Lafayette Petroleum Club, Lafayette, La.

26-Mar. 1 American Institute of Chemical Engineers, petrochemical and refining exposition, Municipal Auditorium, New Orleans.

26-Mar. 2 American Institute of Mining, Metallurgical, and Petroleum Engineers, annual meeting, Chase and Park Plaza Hotels, St. Louis.

MARCH

1 Institution of Mechanical Engineers (Great Britain), symposium on user experience of large-scale industrial vacuum plant, London.

3 Ohio Oil and Gas Association, winter

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ATLAS EMULSIFIER cuts $17,675 From Mississippi Drilling Costs

Savings in bits and rotating hours on Arkansas Fuel Oil Corporation's R. L. Everett No. 1 in Magee Field, Mississippi, cut contractor's drilling costs $2.53 per foot, based on $50 per rotating hour, when compared to the company's previously drilled Lavon Womack No. 1. Both wells were drilled in the same field and under almost identical conditions . . . except for the mud employed. Whereas the comparison well was drilled with a caustic-quebracho mud of higher weight and viscosity, R. L. Everett No. 1 utilized a low-solids oil-in-water emulsion made with an Atlas emulsifier.

Operator, Arkansas Fuel, and contractor, Larco Drilling Company, attribute extended bit life and increased penetration rate directly to the drilling fluid.

DRILLING RECORD COMPARISON

	R. L. Everett No. 1	Lavon Womack No. 1
Mud	Trimulso Emulsion	Caustic-Quebracho
Interval	5,050-12,857	4,955-12,403
Feet Drilled	7,807	7,448
Bits	38	47
Feet/Bit	205.4	158.5
Wt. on Bit	25,000-70,000	25,000-36,000
Rotating Hrs.	317	630
Feet/Hr.	24.6	11.6
RPM	80 to 130	70 to 140
Bit Size	9⅞	9⅞
Pump Size	1-16"	1-20" 1-16"
Liner Size	6	6¾

$2,025 saved

$15,650 saved

Atlas emulsifier is sold through distributors under these tradenames . . . each is the product of Aquaness Department, Atlas Powder Company:

TRIMULSO®

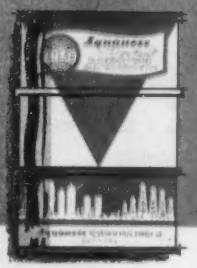
Distributed by Baroid Division, National Lead Company

Registered trademark Baroid Division, National Lead Company

DRILLING MILK

Distributed by Magnet Cove Barium Corporation

Registered trademark Magnet Cove Barium Corporation



ATLOSOL

Distributed by Milwhite Mud Sales Company and other selected mud companies

Registered trademark Atlas Powder Company

ATLAS EMULSIFIERS IMPROVE A GOOD DRILLING FLUID

Because Atlas oil-in-water emulsion muds provide better oil action, they improve hole conditions, extend bit life, and increase penetration rates.

Better Hole Conditions. Atlas oil emulsion decreases torque as much as 50% . . . the hole is kept cleaner and pump pressures are correspondingly lower. There is less danger in lost-circulation and low-pressure zones.

Longer Bit Life. Atlas oil emulsion prevents balling, provides better cutter and bearing lubrication. Greatly extended bit life reduces bit costs, reduces rig hours lost to trip time.

Faster Drilling Rates. Atlas oil emulsion makes more feet of hole per hour. Oil lubrication combines with improved hole condition to increase drilling rates in competent and troublesome formations.

Aquaness CHEMICALS ATLAS POWDER COMPANY

Aquaness Department, Atlas Powder Company
P. O. Box 21072 • Houston 26, Texas

meeting, Deshler Hilton Hotel, Columbus.

7-8 University of Oklahoma, School of Geological Engineering, seventh biennial geological symposium, Student Union Building, University of Oklahoma.

8-10 American Petroleum Institute, Division of Production, southern district meeting, Captain Shreve and Washington-Youree hotels, Shreveport, La.

13-16 Kentucky Petroleum Marketers Association, sixth management institute, conducted by the University of Louisville, Brown Hotel, Louisville.

13-17 National Association of Corrosion Engineers, annual meeting and corrosion show, Hotel Statler, Buffalo, N. Y.

15-17 Natural Gasoline Association of America, annual convention, Baker Hotel, Dallas.

21-23 American Power Conference, twenty-third meeting, Sherman Hotel, Chicago.

22-24 American Petroleum Institute, Division of Production, southwestern district meeting, Cole Hotel, Albuquerque.

23 National Industrial Conference Board, general session, Shamrock-Hilton Hotel, Houston.

27-29 Midwest Gas Association, annual meeting and convention, Sheraton-Fontenelle Hotel, Omaha.

27-31 Instrument Society of America, symposium on temperature measurement and control in science and industry, Veterans Memorial Auditorium, Columbus, Ohio.

28-29 University of Oklahoma, Schools of Petroleum and Gas Engineering, gas conditioning short course, Oklahoma Memorial Union Building, University of Oklahoma, Norman.

APRIL

4-5 University of Kansas, gas compressor institute, Liberal, Kans.

5-7 American Petroleum Institute, Division of Production, Mid-Continent district meeting, Mayo Hotel, Tulsa.

6-7 University of Oklahoma, School of Mechanical Engineering, short course on industrial engines, University of Oklahoma, Norman.

9-12 Western Petroleum Refiners Association, annual meeting, San Antonio, Tex.

9-13 American Society of Mechanical Engineers, oil and gas power conference and exhibit, Jung Hotel, New Orleans.

10-11 American Society of Mechanical Engineers, maintenance and plant engineering conference, Bancroft Hotel, Worcester, Mass.

11-13 Petroleum Industry Electrical Association and Petroleum Electrical Supply Association, annual conference, Moody Convention Center, Galveston, Tex.

17-19 Instrument Society of America, symposium on instrumental methods of analysis, Shamrock-Hilton Hotel, Houston.

18-20 University of Oklahoma, southwestern gas measurement short course, North Campus, University of Oklahoma, Norman.

19-21 National Petroleum Association, semi-annual meeting, Hotel Cleveland, Cleveland.

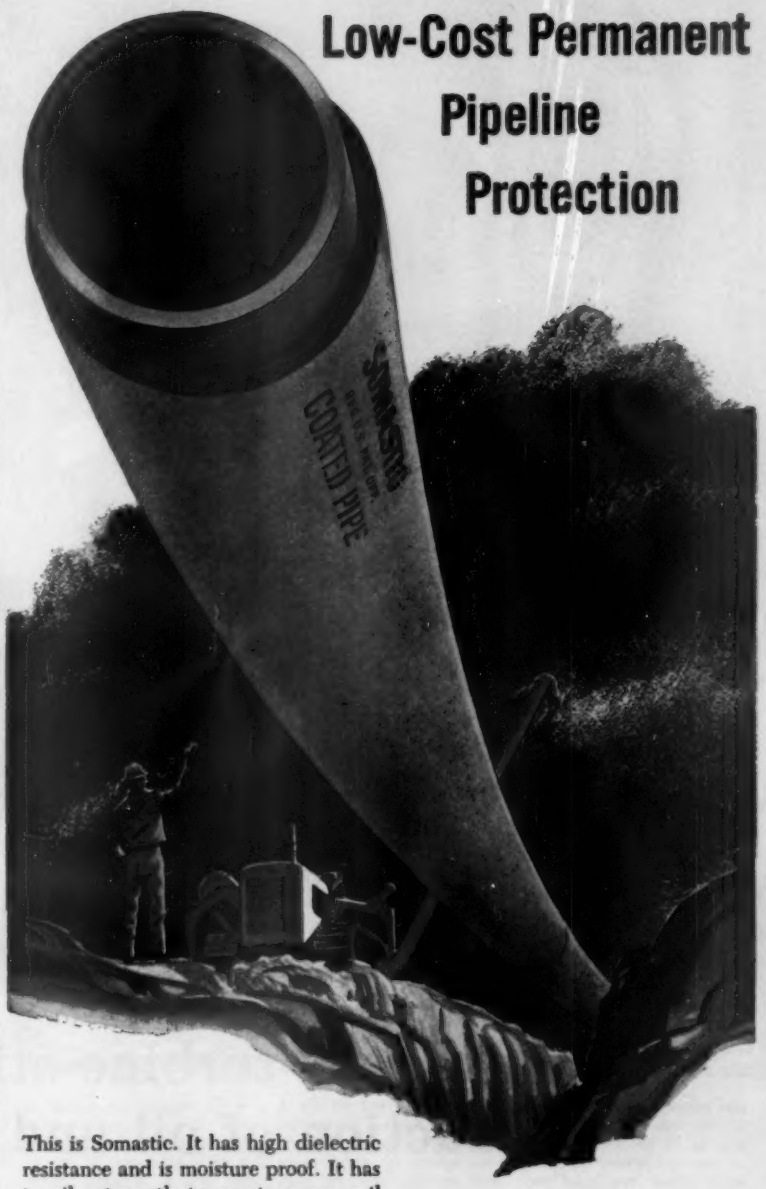
20-21 Society of Petroleum Engineers of AIME, East Texas-Louisiana-Arkansas gas-technology symposium, Tyler, Tex.

24-26 Southern Gas Association, meeting, New Orleans.

24-27 American Association of Petroleum

SOMASTIC®

Low-Cost Permanent Pipeline Protection



This is Somastic. It has high dielectric resistance and is moisture proof. It has tensile strength to meet severe soil stresses and depression forces. It has outstanding resistance to corrosive soils. Somastic is without question the finest pipeline protection available today.

Somastic provides lowest cost protection in both difficult and normal exposures because it gives virtually permanent protection.

Write for data giving complete facts on the advantages of Somastic.

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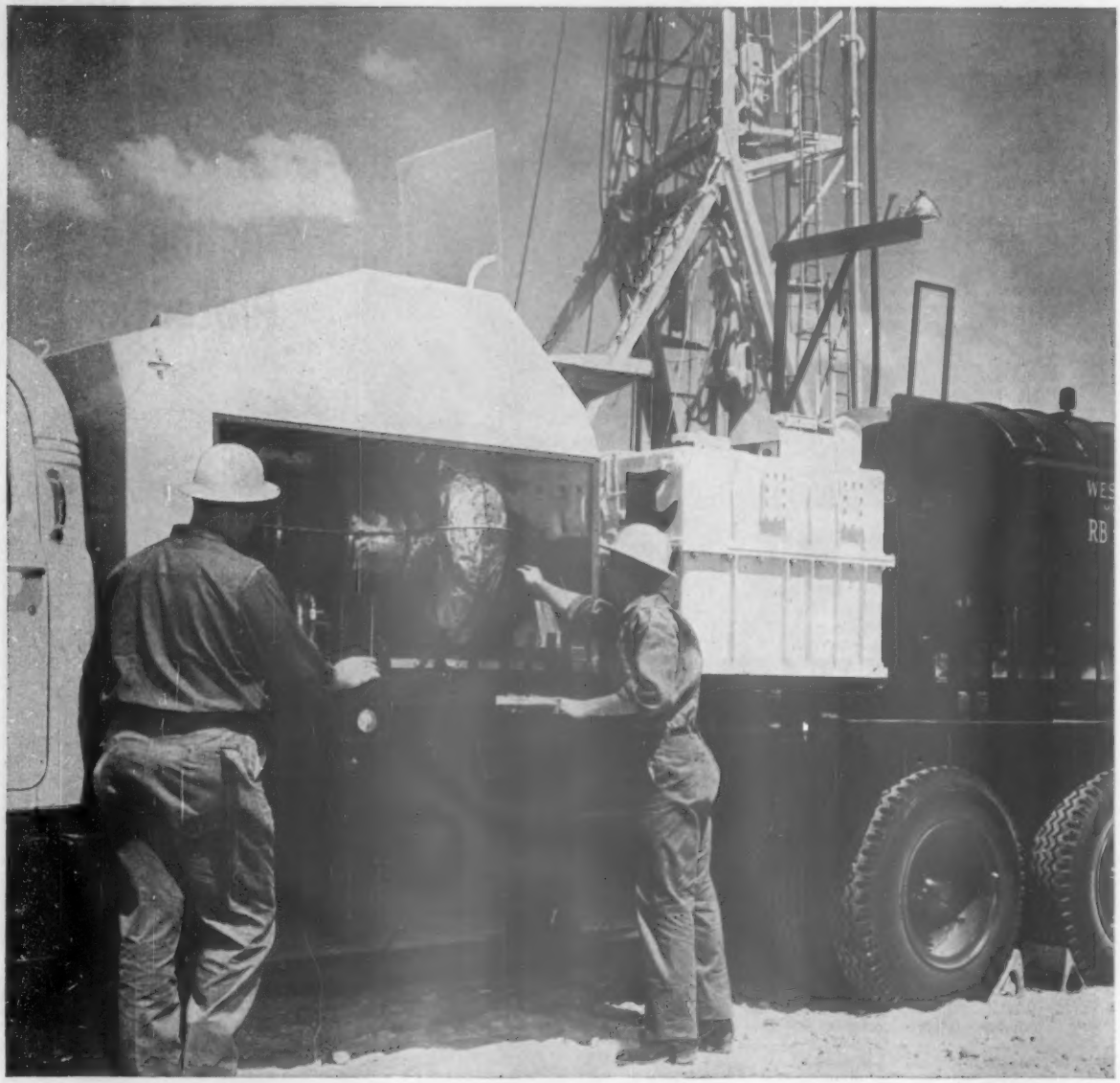


Solar gas turbine stimulates production of oil and gas wells

OIL FRACTURING OPERATIONS — used to stimulate production of oil and gas wells — must take place at the well site. This means that fracturing and acidizing pumping units must be lightweight and mobile — yet provide in excess of 1000 hydraulic horsepower for most operations.

The Western Company's new 1000 hydraulic horsepower fracturing pump is powered by Solar's *Saturn* T-1000 gas turbine engine. Up to 1250 hp is required to drive the pump in this application. Weight of the truck and turbine-driven fracturing unit is significantly less than 500 hp diesel units currently used by Western. The *Saturn* T-1000 turbine-powered pump delivers twice the hydraulic hp of the diesel units — reducing by 50% the number of units needed per operation.

The *Saturn* T-1000 engine weighs only 1200 lbs and occupies less than 51 cubic feet. It is simple in design, starts instantly from —65 degrees F to 130 degrees F, and takes full load in seconds without warmup. It has been engineered for simplicity of operation and long life under industrial conditions. As a compact and reliable power source for generators, compressors, pumps, and other oilfield equipment... investigate the *Saturn* T-1000 gas turbine. There's a Solar gas turbine for almost every application in the 50 to 1250 hp field. Write for particulars to Dept. H-187, Solar Aircraft Company, San Diego, California.

SOLAR
AIRCRAFT COMPANY
A subsidiary of International Harvester Company

Geologists, Society of Economic Paleontologists, and Rocky Mountain section of AAPG, annual meeting. Denver Hilton Hotel, Denver.

26-28 American Petroleum Institute, Division of Transportation, pipeline conference, Chase-Park Plaza Hotel, St. Louis.

27-28 Rocky Mountain Oil and Gas Association, midyear meeting, Northern Hotel, Billings, Mont.

28 Natural Gasoline Association of America, Oklahoma regional meeting, Lake Murray Lodge, Ardmore, Okla.

30-May 2 Independent Petroleum Association of America, midyear meeting, Roosevelt Hotel, New Orleans.

30-May 3 Liquefied Petroleum Gas Association, convention and trade show, Conrad Hilton Hotel, Chicago.

MAY

3-5 American Petroleum Institute, Division of Production, Rocky Mountain district meeting, Gladstone-Henning Hotel, Casper, Wyo.

4-5 Society of Petroleum Engineers of AIME, oil recovery conference, Midland, Tex.

4-5 Pacific Coast Gas Association, Inc., transmission conference, Biltmore Hotel, Santa Barbara, Calif.

7-10 American Institute of Chemical Engineers, meeting, Sheraton-Cleveland Hotel, Cleveland.

8-11 American Petroleum Institute, Division of Refining, midyear meeting, Rice Hotel, Houston.

9-11 Western Joint Computer Conference and Exhibit, Ambassador Hotel, Los Angeles.

10-12 American Society of Mechanical Engineers, production engineering conference, Royal York Hotel, Toronto.

11-12 American Petroleum Institute, Division of Production, Pacific Coast district meeting, Biltmore Hotel, Los Angeles.

14-16 Texas Independent Producers and Royalty Owners Association, Scharbauer Hotel, Midland, Tex.

16-19 American Petroleum Institute, Division of Marketing, midyear meeting, Americana Hotel, Miami Beach.

19 Natural Gasoline Association of America, Permian Basin regional meeting, Lincoln Hotel, Odessa, Tex.

21-24 American Petroleum Institute, Division of Transportation, midyear highway conference, Bellevue Stratford Hotel, Philadelphia.

23-24 Western Petroleum Refiners Association, Mid-Continent regional technical-industrial relations meeting, Hotel Lassen, Wichita.

25-26 American Institute of Mining, Metallurgical, and Petroleum Engineers, annual Rocky Mountain petroleum sections, joint meeting, Salt Lake City.

JUNE

5-8 Instrument Society of America, summer instrument-automation conference and exhibit, Royal York Hotel and Queen Elizabeth Hall, Toronto.

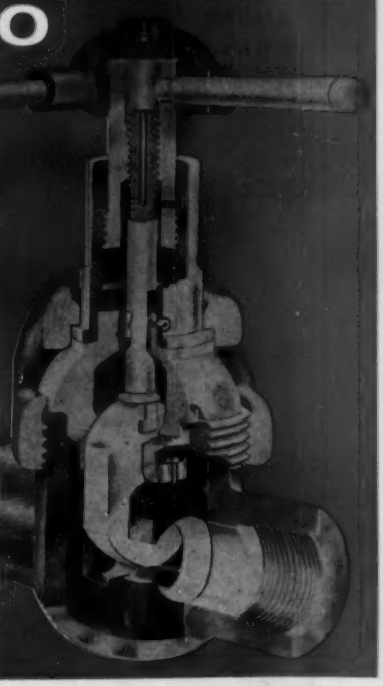
9-17 European Congress of Chemical Engineering and Achema Congress, thirteenth exhibition and congress of chemical engineering, Frankfort am Main, Germany.

11-15 American Society of Mechanical Engineers, summer annual meeting, Statler Hilton Hotel, Los Angeles.

12-14 American Petroleum Institute, Division of Transportation, annual tanker conference, Oyster Harbors, Cape Cod, Mass.

The DEMCO

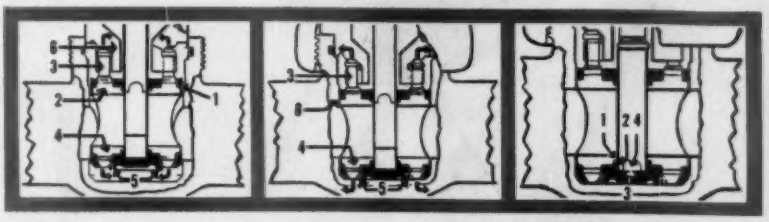
GATE VALVE



Seals DROP-TIGHT without "bumping"

Positive sealing under the highest line pressures—*with minimum torque*—makes the Demco GATE VALVE your best buy for every mud line application . . . for water flooding, hydra-frac, acidizing and cementing service . . . and for many production applications.

Demco's secret lies in its unique one-unit seal assembly, with its patented spread-ring construction. Here's how it works . . .



A. Resilient seat assembly (1) is reinforced with steel wear rings (2), having integral projecting pins at top (3) and bottom (4). In normal contracted position, the seat assembly is easily inserted in, removed from the body. Until the seat assembly is bottomed, the steel spread ring (5) does not act upon the lower projecting pins, nor do the bonnet legs (6) act upon the upper pins.

B. With the bonnet down and the seat assembly bottomed, the spread ring (5) has forced the lower projecting pins (4) outward. Similarly, the upper pins (3) have been wedged outward by the descending bonnet legs, providing a tight seal between body wall (8) and seat, preventing entrance of abrasives between seat and body wall.

C. As gate is closed, leading edge of gate slides past wear ring (1), contacts rubber ring (2) for positive rubber-to-metal seal. Seal occurs before gate touches rubber cushion (3), eliminating need for "bumping." Relief in bottom of gate (4) allows straddling of solid particles that might interfere with proper closure.

Available at supply stores everywhere in 1,000, 1,500, 2,000, 3,000 and 5,000 psi working pressures . . . in two-, three- and four-inch sizes.

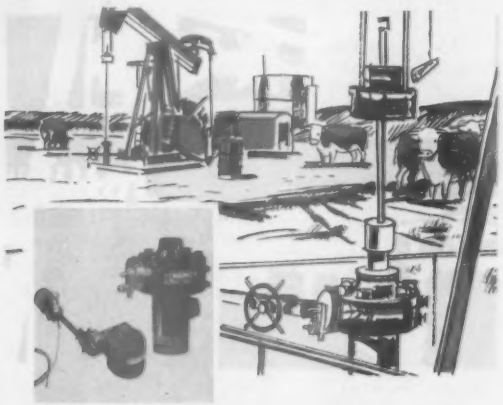
DRILLING EQUIPMENT MANUFACTURING CO.

Oklahoma City, Oklahoma

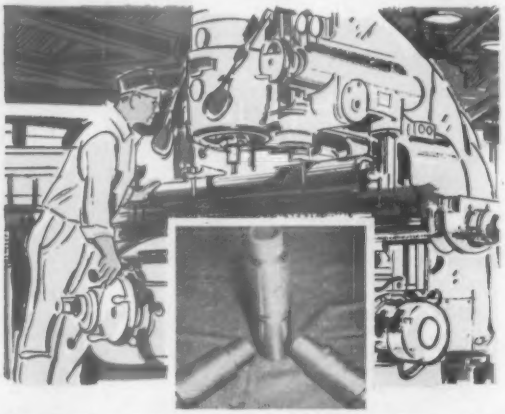
DRILLING EQUIPMENT MFG. CO. DEMCO OKLAHOMA CITY, OKLA. U.S.A.

ANOTHER CASE OF
HOMCO MANUFACTURING
VERSATILITY

"Only experience guarantees quality in manufacturing... and HOMCO has it!"



Homco Ace-O-Matic Rod and Tubing Revolvers are effective, economical methods of extending the life of rods and tubing on pumping wells. Compact (body diameter: 5-ins. OD) Homco Ace-O-Matic Revolvers fit most carrier bars. Rod revolver is easily installed at any time. Tubing revolver may be installed before tubing is in place or when tubing is pulled for well workover. In addition to giving extra life to the polish rod, rod revolver helps control paraffin. For added safety, tubing revolver has all the necessary pressure control features of a tubing hanger.



Homco Tubing Tool Joints convert tubing to workover strings and protect the tubing string against crushing action of tongs. Designed for fast make-up and break-out, Homco Tubing Tool Joints take all the wear and eliminate the danger of galling regular tubing threads. Machined from heat-treated S.A.E. 4140 steel, Homco Tool Joints are shipped in skidded steel cases to prevent damage. Joints are available as tool joint or coupling type.

IF YOU'RE LOOKING FOR EXPERIENCE

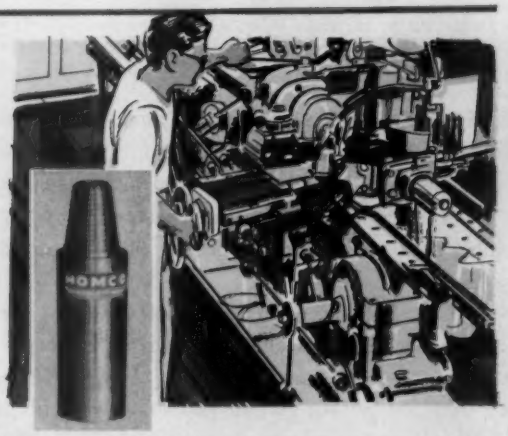
IN QUALITY MANUFACTURED PRODUCTS...

HOMCO HAS IT!

These proven products from the oil industry's most complete manufacturing and service organization guarantee you top quality tool performance.

Rod and Tubing Revolvers
Tubing Tool Joints
Type "E" Packers
Jet Bypass Valves
Precision Built Steel Subs

Homco Type "E" Packers are ideally suited for high pressure, high temperature completions. Constructed of heat-treated S.A.E. 4142 steel, these packers can be set with a considerable amount of weight which assures that packer will not become dislodged due to high pressure differentials and further insures that a positive seal is maintained. Incorporated in the packer is an automatic bottom which requires 7 to 8 turns to disengage, but may be re-engaged by simply raising the tubing string. This feature means that packer cannot disengage while going in the hole and cause premature setting.



Homco Precision Built Steel Subs are manufactured of high grade, heat-treated alloy steel. Homco Subs are manufactured, machine finished, accurately threaded and gauged to individual requirements to give you the highest quality drilling equipment you can buy. Homco Subs have uniform strength and rigid ruggedness, and are magnaflux inspected to assure that all materials meet Homco's high quality standards. These tools are available as Reducing Subs, Drill Collar Subs, and Drain Subs.

Homco Jet Bypass Valves are used with jet type drill bits to provide auxiliary openings in the drilling assembly above the bit. The valve permits normal fill of pipe while running in the hole thereby reducing the possibility of damage to lost circulation zones because of pressure surges. Valve remains in closed position when circulating and directs all the drilling fluid through the bit. When drilling assembly is retrieved, valve is in open position permitting pipe to drain, thus the swabbing effect of the bit is reduced as it is retracted, and the necessity of pulling wet strings of pipe is eliminated.

WHATEVER YOUR DRILLING EQUIPMENT NEEDS, CALL HOMCO FIRST! Homco's experienced personnel have at their disposal all the required facilities to research and manufacture quality products that more than meet the oil industry's most exacting demands. For further information pertaining to any Homco product, contact your local Homco Supply Store.

HOMCO ALSO OFFERS

HOMCO

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NOW - THE SOLUTION TO INTERNAL JOINT CORROSION!

New SERIES 500 Epoxy-Joined Line Pipe

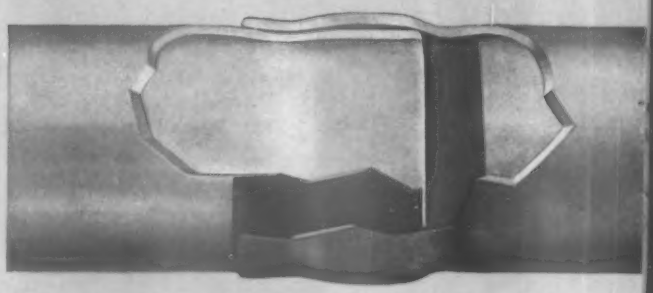
Radically new SERIES 500 epoxy-joined steel pipe eliminates costly, time-consuming welding operations and provides a rapid, low-cost method of joining line pipe. *More importantly,* it finally provides the answer to joining line pipe without the danger of corrosion at every joint.

SERIES 500 pipe is flared to a bell shape on one end to receive the plain end of another pipe length. Contact surfaces are coated with an epoxy adhesive before they are joined. A patented tool then crimps the joint, providing mechanical strength while the epoxy sets. The pipe can be laid immediately.

Field tests over a 12-month period have proved the advantages of this new method. It has joined line pipe rapidly and permanently, providing a plastic-lined joint that *prevented internal joint corrosion.* The high-strength, lightwall pipe has substantially reduced material costs. Installation time and costs have also been reduced because welding operations were eliminated.

Recently SERIES 500 pipe was used to lay a 20,000-foot, 4-inch gas line. Pipe costs were 58 per cent lower than the cost of conventional pipe. Installation costs were also reduced 25 per cent and installation time was about half that required for welded-joint pipe.

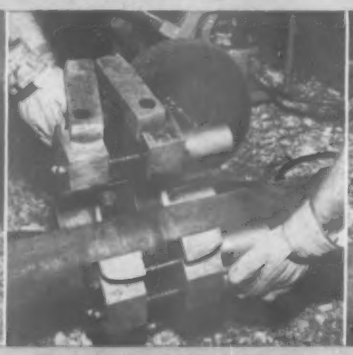
Tex-Tube manufactures the new SERIES 500 pipe in sizes from 1½ to 4½ inches. Present working pressures are 1200 psi for pipe from 1½ through 3½ inches and 800 psi for larger pipe. Research is expected to increase future working pressures to the yield strength of the pipe.



Internal construction of SERIES 500 pipe joints is strong and simple. The internal epoxy coating prevents joint corrosion.

First the plain-pipe end is coated with epoxy adhesive.

Next the inside of the bell-shaped end is coated with epoxy.



The hydraulic crimping tool is then placed around the joint.

Crimping holds joint firmly while epoxy sets. Pipe can be laid immediately.

PIPE MANUFACTURERS
High Tensile Lightwall Pipe
Oil Well Casing
Oil Well Tubing
Structural and Mechanical Tubing
Shot Hole Casing
Upsetting, Threading, Normalizing

DISTRIBUTORS
Oil Country Goods
Line Pipe
Refinery and Chemical Plant Piping

TEX-TUBE, INC.

1503 NORTH POST OAK ROAD • HOUSTON, TEXAS
Sales Offices in Midland, Dallas, Amarillo, Tulsa, Los Angeles and Pensacola

the Journal said...

50 years ago

December 15, 1910

T. N. Barnsdall, one of America's leading independent oil producers, arrives in Paris to complete negotiations with a French syndicate for the sale of a half interest in all his oil-producing properties in Oklahoma and Illinois. In Oklahoma, his properties are operated in the name of Barnsdall Oil Co., and in Illinois as Red Bank Oil Co.

The protracted drouth in Oklahoma and Kansas is causing such an acute shortage of water that oil operations in many areas are having to shut down. Pipeline pumping stations as well as drilling rigs and pumping wells are being idled.

Great Northern Railroad joins the swelling list of railroad companies converting locomotives from coal to oil burners. All its 115 locomotives operating over the Cascades from Spokane to Seattle are being changed over.

25 years ago

December 12, 1935

Oil-exporting companies face a possible embargo on shipments to Italy as U. S. Government considers sanctions with other nations in Italian-Ethiopian war. Standard Oil Co. of New Jersey denies rumor of huge oil deal with Mussolini.

Major refinery building program gets under way in Michigan with oil activity at high level. First major pipeline outlet for state's mounting oil production nears completion with capacity to move half of state's present daily output of 50,000 bbl. to Toledo refineries.

Much-watched Turtle Bay prospect in Chambers County, Texas Gulf Coast, proves productive as Stanolind Oil & Gas Co. brings in its initial well (1 Middleton) flowing 27 bbl. of 32°-gravity oil per hour through ¼-in. choke from 6,600-ft. Frio sand.

10 years ago

December 14, 1950

World's producing-depth record to topple as Standard Oil Co. of California tests oil-showing Eocene sand at total depth of 15,550 ft. in its Socal 2 Mushrush, a half mile southeast of the company's present record-holding 5 Mushrush well in Wasco field, in California's San Joaquin Valley district. The latter, completed in 1949, produced from total depth of 15,530 ft.

Nevada's deepest test, a far-removed wildcat drilled as a joint exploratory venture by Continental Oil Co. and Standard Oil Co. of California in White Pine County, in the immense untested Pancake Range section, is abandoned as dry at 10,314 ft.

JOURNALLY SPEAKING

I Dreamed I Was an Oil Executive in my Maidenform Bra

WE WOULD HATE to be an executive of a big oil company right now. Everybody is looking at oil executives with a critical eye. They are being blamed for everything that is wrong with the oil business, and are expected to get it back into proper shape.

Management is the new whipping boy for the industry's ills. It used to be imports, the weather, the Government, the majors, the independents, or what have you. Now management is in the spotlight.

Giving management hell is rapidly becoming the oil industry's most popular indoor sport. And the game was played with great gusto at the recent API meeting. There oil management was laid out on the half-shell, naked as an oyster, for public scrutiny.

Oh, there wasn't anything on the program with a title indicating that executives were being sentenced to 30 lashes. The cat-o'-nine-tails was subtly held in a velvet glove. But speaker after speaker, in analyzing what's wrong with the oil business and what should be done about it, put the bee on management's back. It was a Roman holiday with executives the martyrs thrown to the lions.

Joining in the sport, we thumbed through a sheaf of the API papers and, pretty much at random, compiled a partial catalog of management sins and a list of penances executives must do to redeem themselves—or, rather, to redeem the industry, because nobody seemed to care much what happens to executives as individuals.

The list ranged all the way from the flat injunction "we must be better managers," by the top dog of a major company, to the admonition to serve on the local school board to get an inside check on what the politicians are doing to us, by a self-confessed ward heeler.

If anyone pictures a top executive as a sort of fancy bow on the ribbon holding the company package together, that dream would be rudely shattered by the list of things management ought to be doing right now. According to various API speakers, oil-company executives aren't doing their jobs right unless they:

. . . Conduct motivation studies into the psychology of motorists to find out why they drive or don't drive, and what they like or don't like about filling stations.

. . . Make statistical analyses of long-range demand trends and schedule future capital investments and operating policies so as to avoid difficulties in later years.

. . . Lobby state legislatures and commissions into modernizing conservation laws and regulations.

. . . Teach jobbers how to keep their accounts so the wife's grocery money and that vacation in Florida won't be charged against the dealer margin on gasoline.

. . . Keep close tabs on world-wide oil activities and what foreign governments are doing, and fit the U. S. industry into the pattern.

. . . Shake up the company's organization to get more work done by fewer people.

. . . Get into politics personally and actively on the local level in order to influence government policies all the way to the top.

. . . Pay close attention to the company's scientific research work and get a better payout by integrating the results into immediate operations and long-range policies.

. . . Stimulate creative thinking among employes and set an example by shucking old habits and experimenting with new ways of doing things.

. . . Ward off unfavorable opinion and bad legislation by being better public-relations men and making all employes into active PR men.

. . . Have market awareness and discover new ways to sell more oil.

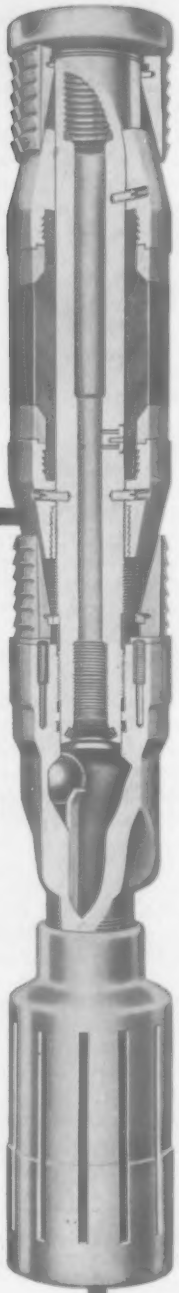
. . . Reduce paperwork for everybody else.

There were more, but that sample will do for a starter. Oil management has quite a job laid out for it. Everybody in the industry will be watching to see how well management performs.

Just one other thought. Nobody singled out just big-company presidents as exclusively responsible for everything. Maybe this management responsibility should be shared by everybody up and down the line throughout the whole oil business.

—Henry D. Ralph.

Reliable...best describes the Baker Cement Retainer



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3. Packoff is uniformly positive and dependable at either high or low pressure differentials. Opposed slips hold from either direction.
4. Ability to maintain packoff is independent of fluid pressure, or of set-down weight or tension.
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6. The Baker Cement Retainer drills up easily and quickly. It's available in drillable, corrosion-resistant cast iron or in fast-drilling magnesium.
7. There's a full range of sizes and a family of accessories to help get the job done in the best way.
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RELIABLE: The Baker Cement Retainer rates the word. For here is probably the most thoroughly proved squeeze cementing tool in use today. From the trend-setting original Baker Cement Retainer, to the latest refined models, it has contributed importantly to the success of tens of thousands of high-pressure squeeze operations.

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THE BAKER SERVICEMAN is a man who runs Baker squeeze tools with confidence. He is a specialist—Baker tools are his only business. He knows the well-service problems of the area, because that is where he works and lives.

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Economic waste is bad conservation

THE COMPANY EXECUTIVE addressing the Interstate Oil Compact Commission was ostensibly talking to other oil men. But state regulatory bodies could well take to heart what he said about economic waste.

We aren't making wise economic decisions, he said. We are guilty of economic waste, which violates the basic principles of conservation. We need an economic balance between waste and competition.

This is a subject on which state commissions have played ostrich.

IT'S BEEN TABOO to use the words "economics" and "conservation" in the same paragraph. Whenever economics is mentioned, some conservationists run and hide. They won't even discuss the prevention of economic waste in oil production.

Many states have laws which seem to prohibit consideration of the economic aspects of conservation. In other states the subject is broached only gingerly. At its previous meeting the Compact Commission smugly smothered a suggestion that economics be a topic for its study.

It is time for conservation authorities to take their heads out of the sand and admit that conservation has many economic impacts. Conservation is more than just saving oil. It includes fostering an efficient and healthy industry able to supply the nation's future fuel needs at reasonable prices.

Today the domestic producing industry, caught in a cost squeeze, is making drastic efforts to increase its efficiency. In this it frequently finds itself hobbled by obsolete conservation rules that perpetuate archaic practices long since outmoded by advances in the technology of reservoir engineering.

Regulatory authorities have an obligation to see that the public is supplied with oil as economically as possible consistent with avoidance of physical waste. But many commissions, particularly in the older producing states, appear indifferent to this responsibility.

A case in point is the recent action of the Texas Railroad Commission in rejecting a cost-cutting program in East Texas field for no better reason than that it was a sharp departure from practices that looked good a generation ago.

GOOD CONSERVATION is good economics. It is not good conservation for a state to require overinvestment, inefficient practices, and unneeded producing capacity.

There are state regulations that force operators to drill wells for allowables instead of for new reserves. There are invitations—even requirements—for economically wasteful practices where there should be incentives for greater efficiency and a larger ultimate supply of oil.

The IOCC has done much to foster conservation technology. Now its members should do more to foster the application of that knowledge.

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Young Liberal Named to Top Oil Post

• Arizona's youthful Stewart Udall is a stranger to the industry, and he voted against the gas bill, but he's an honest, hard worker with an open mind. As Interior Secretary he faces a lot of decisions affecting oil men.

STEWART L. Udall, who will be President Kennedy's Secretary of Interior, has one thing in common with the oil industry: Neither knows much about the other.

Oil industry circles in Washington have a very scanty "book" on the young Democratic congressman from Arizona. As a result, there was little oil comment—favorable or unfavorable—when his appointment was announced last week.

This situation is likely to change rapidly, however, after Udall takes over at Interior. The new administration takes office January 20 and Udall will very quickly be exposed to some major problems involving Interior and the oil industry.

Udall indicated some awareness of this in a press conference last week at the time Kennedy made his selection known. Asked by a reporter if he planned a review of oil-import controls or the fuels policy issue, Udall replied:

"Those problems relate to matters in which all Americans have a vital interest. They are questions which Senator Kennedy and I certainly intend to discuss and study at an early date."

The Udall record . . . Udall, elected to Congress in 1954, is a member of the so-called liberal block of young Democratic congressmen. This group includes Congressmen James Roosevelt of California, Lee Metcalf of Montana, now a senator-elect, and George McGovern of South Dakota.

However, Udall is not characterized by those who know him as a "flaming" liberal. Rather, he has a reputation as a hard worker, scrupulously honest, who attempts to keep an open mind.

Here is how his record in Congress shapes up:

He voted for the increase in the federal gasoline tax and, in 1955, he voted against a natural gas bill aimed at freeing producers from federal regulation. However, he did not play a leading role in either instance.

He worked vigorously last year for the Kennedy version of a labor reform bill.

He supported legislation to increase minimum wage standards.

He has generally supported reciprocal trade and foreign aid and basically is opposed to tariffs and quotas. (But he did support a quota for copper imports.)

He strongly favored the Boggs Bill (H.R. 5), designed to help encourage and protect foreign investments by U. S. firms.

He is a member of the House Interior and Insular Affairs Committee as well as the House Labor Committee. But he has played little or no part in oil or gas matters handled by the Interior Committee. His efforts in this committee have been devoted principally to Indian affairs and reclamation projects.

His political rise . . . Udall stepped into the political spotlight last summer when he managed to swing his state's delegation to Kennedy at the Democratic convention even though Lyndon Johnson supporters had been confident they had the Arizona votes in their pocket.

Coming at the time it did, Arizona's swing from Johnson to Kennedy proved to be one of the final, decisive nails in the coffin of Johnson's presidential hopes.

The word in Washington is that Udall's efforts at the convention,

The man:

Here are the highlights in the life of Stewart L. Udall, chosen to be the next Secretary of Interior:

Age 40. Born and educated in Arizona. Law degree from the University of Arizona.

Active member of the Mormon Church.

Military service as an aerial gunner on combat missions in World War II.

Practiced law in Arizona with his brother in Tucson after the war.

Elected to Congress in 1954 and reelected in 1956, 1958, and 1960.

Married. Six children.

coupled with his work on labor and minimum wage legislation, caused him to be tabbed by Kennedy leaders as a bright, aggressive "comer."

Udall, who comes from a family active in Arizona political and legal circles, apparently is popular with voters in his state, having been re-elected by comfortable margins in 1956, 1958, and 1960—the last victory despite the fact that Arizona voted for Nixon.

The job ahead . . . Whether Udall fully realizes it yet or not, oil and gas problems will occupy a great deal of his time on his new job, and the direction he moves will be important to the oil industry.

On the matter of time, the present Interior Secretary Fred Seaton, commented to a reporter not long ago that although the Oil Import Administration is staffed by only a few people, oil - import - control problems have taken up about 30% of the secretary's time.

There is little reason to believe that the pressure of oil-import-control problems will lessen in the months ahead. Thus Udall will face some key decisions.

Furthermore, since Kennedy has committed himself to a study of natural resource problems, it is certain that the new head of the Interior Department will find himself deeply involved in that study.

Those are the two biggest problems at present, but there is a wide range of other oil-related matters on which Udall will have to decide—or help decide—administration policy.

For example, under the present administration, Interior Department has pressed hard for helium plant construction by private industry. Under the terms of the helium act, however, the Government is authorized to step in and build the plants if it so chooses.

Whether Udall will continue to seek industry participation or whether he will want to swing quickly to government action remains to be seen.

Other policy matters involve the direction of the newly-created Office of Coal Research in Interior, Alaskan oil development contracts, offshore boundary determinations, and proposed legislation establishing wilderness areas in which little or no oil development would be permitted.

Important, too, will be the men he will name to, or retain in, top oil advisory positions within the department.

It is also possible that the Democrats will want to resurrect some of their earlier programs which were shelved by the Republican administration.

For instance, the present administration virtually ended the oil-shale program, including the operation of an experimental plant at Rifle, Colo.

And efforts to make oil from coal—once pressed vigorously at Interior—have been at a standstill.

Will Udall want to set such programs as these in motion again? There has been no indication of such a move, but that does not rule out the possibility.

Whatever policies Udall and the administration evolve regarding oil and gas matters, it is likely that changes will be gradual, and that they will be taken only after careful study.

There had been earlier speculation that the new Kennedy administration planned to undertake vigorous action at once, something like the first 100 days of the 1932 Roosevelt administration. But the odds are now strong against any such attempt.

Most of the upcoming congressional year is likely to be spent principally on a few of Kennedy's broad programs involving care for the aged, minimum wage increases, depressed area aid, and foreign problems.

It does not seem likely that any oil issues are high on the new administration's list for action at this time.

Washington oil observers see some advantage to this for it gives the industry an opportunity to present its story to the new officials, such as Udall, before the administration's oil policies become frozen.

Obviously, therefore, the early stages of the new administration will be important ones for the industry and the nation.

Steady Climb in Petroleum Demand Predicted

• Study by Canadian-American group also foresees growth for natural gas and gas liquids in both countries over 20-year period.

AN optimistic outlook for petroleum demand in the United States and Canada during the next 20 years is forecast in an economic study made by the Canadian - American Committee.

The prospect:

. . . In Canada—a 4.4% annual gain in crude petroleum and products demand, a 10.4% annual gain for natural gas, and a 13.7% annual gain for natural-gas liquids.

. . . In the United States—a 3.8% annual gain for crude, a 4.5% annual gain for natural gas, and a 5.2% annual gain for natural-gas liquids.

The report, "The Future of Industrial Raw Materials in North America," was written by Wilbert G. Fritz of the U. S. Office of Civil and Defense Mobilization for the Canadian-American Committee. This committee was formed 3 years ago by the National Planning Association and the Private Planning Association of Canada.

Fritz noted that consumption of oil and gas has shown a less intense rise in the United States than in Canada recently. He added that growth in both countries likely will be smaller in the future.

The forecast of an annual 3.8% growth for crude demand in the next 20 years would mean a daily production in the United States in 1980 of 20,500,000 bbl. This rate is higher than the 3.4% annual gain recently projected by Resources for the Future, the 3.2% rate projected in a National Planning Association study, or the 3% rate predicted by the Paley Commission. It still is well below the 5.8% annual increase since 1947.

An outstanding new element in the demand picture is the introduction of jet aircraft. Fritz said this alone could account for a significant share of the total petroleum consumption by 1980.

He also noted that the effects of compact cars and new developments in electric and diesel engines on consumption may be offset in the future. The emphasis is still on performance and speed, he said. A vast network of throughways also will have the effect of sustaining demand growth rates by increasing the mileage driven.

Fritz thinks his projections may be conservative. He sees a 4.2% annual increase in gross national product of the two countries. This is broken down to a growth in GNP of 4.9% per year in Canada and 4.1% in the United States. He adds that the potential of North America probably is still understated by a considerable margin.

Gases Get Roles as Cheap Brine Converters

• One new method of obtaining fresh water from the sea uses propane as a hydrate-forming agent. Another system employs butane as a refrigerant. The success of the conversion plants would mean sizable new gas markets.

PROPANE AND BUTANE, two products the petroleum industry often is overblessed with, may play an important role in converting sea water into fresh water.

In a novel process being developed by Koppers Research Co., Inc., propane acts as a hydrate-forming material to combine with sea water. The only chemical method among several conversion plans being investigated, the process looks good because of its low energy requirements.

Butane serves as a refrigerant in another process being studied by Blaw-Knox Co., and is reused as a melting agent. Because direct heat transfer is involved in both steps — requiring little energy—this process also looks attractive.

The two new processes were discussed at a session on saline-water conversion in Washington, D. C., last week, at a meeting of the American Institute of Chemical Engineers. Both methods are supported by the Office of Saline Water.

The hydrate process . . . Basically the propane hydrate process consists of combining propane and water to form an insoluble clathrate. The crystals are separated from the mother liquid, washed, and then decomposed to form immiscible layers of salt-free water and propane.

A clathrate compound is chemically described as "a compound in which two or more components are associated without ordinary chemical union, but through complete enclosure of one set of molecules in a suitable structure formed by another." In other words, the water molecules merely surround a propane molecule (in a ratio of approximately 17-1) to produce a stable crystal.

Other hydrate-formers are still being considered but propane appears to be the most desirable material because:

. . . **It has low solubility** in water.

. . . **It is inexpensive.**

. . . **It serves** as a direct heat-transfer medium.

. . . **It is economically attractive** from the viewpoint of pressure and temperature conditions.

The authors of the paper, W. G. Knox, M. Hess, G. E. Jones, Jr., and H. B. Smith, Jr., said the goal is a 10,000,000-gal.-daily plant which can produce fresh water for less than 50 cents per 1,000 gal. Work so far has been in the laboratory, but the success of this unit is leading to the construction of a pilot plant.

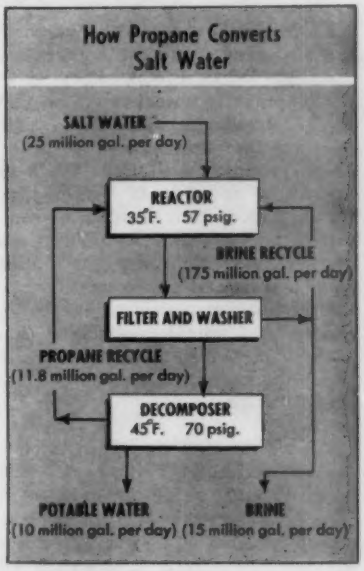
The refrigeration system consists of two stages, a low-temperature primary system and a high-temperature secondary system. Liquid propane is introduced into the reactor where it combines with the water to form a clathrate, and then vaporizes to remove the heat generated by formation of the hydrate crystals.

Addition of the propane also results in the hydrate-forming temperature being raised about 11° F. Knox, who read the paper at the meeting, said this explains why there is a finite drop in production cost when potable water is produced by the propane hydrate process rather than the normal freezing process.

Studies of the rate of hydrate formation showed that a 40% conversion requires minimum energy. This means that in a continuous plant the hydrate would be formed from a 6% (by weight) salt solution.

Butane freezing . . . The Blaw-Knox direct-freezing process appears so attractive that a pilot plant is now being built, speaker George Karnofsky told the meeting.

Using the estimating procedure set by the Office of Saline Water, a commercial plant of 10,000,000-gal.-daily capacity could be built for $20,000,000. Cost for power and chemicals were placed at 19 cents per 1,000 gal.



In this process, sea water is partially frozen to a slush by direct contact with boiling butane at a pressure slightly below atmospheric. Since butane boils below the freezing point of salt water, the heat of vaporization (165 B.t.u. per pound for butane) is supplied by the heat of freezing the water (144 B.t.u. per pound).

The slush formed in this stage is washed free of salt with part of the product water. Then the washed ice is melted by the reverse of the freezing process. Product water and reject concentrated sea water leave through heat exchangers.

Signal Adding Texas, Florida Outlets

SIGNAL Oil & Gas Co. is tripling its multigrade market outlets in Southeast and Central Texas and also will move into Miami, Fla., where multigrade marketing was pioneered by Sun Oil Co.

Signal is placing its Hancock brand at 41 Texas stations in addition to the 20 it acquired in August.

Of the new Texas outlets, 11 are owned by Watson Oil Co., Houston, and had been using the Watson brand name. The Florida stations also are Watson's.

Most outlets have carried independent brands. Some have been purchased, others leased, and others simply supplied with Hancock products.

The Florida stations are in the Miami area. The date for conversion from Watson to Hancock has not been set. They will be competing with Sunoco's six-grade stations.

J. R. Caudle, Signal's marketing vice president for the Houston division, said last week that the venture into blended gasoline has increased sales significantly and that expansion in Texas will continue.

The company last year purchased the Eastern States Petroleum & Chemical Corp. refinery on the Houston ship channel.

U. S. May Ease Credit to Help Sales Abroad

• Equipment makers get a sympathetic ear from Commerce Department in plea for changes in Export-Import Bank rules. Say the manufacturers: Lack of credit is the big factor in the slump in foreign sales of U. S. equipment.

DOMESTIC oil-field equipment manufacturers, seeking to bolster their declining sales abroad, were given some reason last week to hope that U. S.-Government obstacles to such sales may be removed.

In a meeting with Department of Commerce officials in Washington, representatives of oil-field equipment, supply, and service firms pointed out that the biggest barrier confronting them is a lack of export credit.

Commerce Department officials indicated they would recommend that changes in rules be made so the U. S. Export-Import Bank could offer the needed credit.

The problem . . . As it stands now, the Export-Import Bank is not permitted to make or guarantee loans on oil-field equipment sales when the equipment is to be used in a country where there is a government oil monopoly.

This rules out, therefore, any Export-Import Bank credit on sales of equipment to Pemex in Mexico, to Petrobras in Brazil, or to any other nation with a government oil monopoly.

Incidentally, this credit ban applies only to oil-field equipment sales. It does not apply to loans or loan guarantees on sales of other goods.

Domestic oil-field equipment manufacturers pointed out to Government officials that the rule banning Export-Import Bank backing of their sales handicaps them greatly, particularly because more and more nations have taken ownership or control of oil operations. Each time this happens, U. S. firms lose a customer because of the Export-Import Bank rule.

Lacking Export-Import Bank credit, a U. S. firm must make sales either on a cash or a short-term credit basis. Meanwhile, equipment manufacturers in other nations are able to offer lenient, long-range credit terms because of credit support from their government. So they make the sale.

Representatives of U. S. manufacturers said they would be able to compete with foreign manufacturers if this credit advantage were removed.

They said that any price differential is offset by the fact that U. S. oil-field equipment is generally considered superior.

Government officials in Washington appeared pleased that the domestic oil-field equipment manufacturers feel they could compete abroad against foreign firms if only the credit problem were cleared up.

Change will take time . . . In similar meetings with groups from other U. S. industries during recent months, government officials have frequently heard the complaint that differences in wages, together with trade barriers and other handicaps, have made it extremely difficult for U. S. firms to boost their sales abroad.

In most of these cases, the Government has not been in a position to do much to help solve the problems. But last week's meeting was different in that it presented a specific opportunity for Government action to overcome a handicap facing a U. S. industry.

This does not mean, however, that the Export-Import Bank rules will be changed soon. Since the bank's policies are set at cabinet level, it is likely that all the present Secretary of Commerce can do is to recommend changes to the incoming Administration.

But the Government's recognition of the problem was some cause for cheer for the oil-field equipment representatives present at the meeting.

The views of the industry group were expressed principally in statements by Richard E. White, president of Mission Manufacturing Co., and J. P. Dankel of National Supply Co.

White emphasized that the credit limitation is the big stumbling block. Aside from that, he said, the U. S. oil-field equipment industry has some important advantages in foreign markets.

"Because of our many years of experience and our technical leadership, we are generally able to offer products of better quality and to provide better service," he explained.

"We enjoy an excellent reputation of leadership and have excellent contacts throughout the free-world oil industry," he said. "By capitalizing on those advantages, we are often able to overcome the disadvantage of price and of various import restrictions."

White said the U. S. industry does not feel that any type of government subsidy is needed or desirable. But, he said, "We do feel that the facilities of the Export-Import Bank should be made available to the oil-field equipment industry, just as they are to all other industries."

Dankell supported the argument made by White and submitted an exhibit showing the business that had been lost abroad by U. S. firms in the past 3 years.

American equipment is generally preferred regardless of price differentials," he said, "but the incentive of long-term credits with modest interest rates results in many orders being placed in Europe."

Dankel said recent reports indicate that further efforts will be made by European manufacturers to accelerate their export-sales activity.

U. S. Role in Alberta Pipeline Idea Hit

A PROPOSAL to incorporate a new western Canada pipeline company has been criticized in the Canadian Senate on the grounds that it would be controlled by U. S. interests.

The bill to incorporate Aurora Pipe Line Co. was proposed by Sen. Gunnar Thorvaldson of Manitoba. It has been referred to the senate resources committee for detailed study.

Sen. William Brunt of Ontario expressed concern over the fact that two-thirds of the shares of the proposed company would be owned by a U. S. company. Approval would mean that another Canadian industry would be controlled by a foreign corporation.

Thorvaldson said the company would be owned by Hudson Bay Oil & Gas Company Ltd. of Calgary. He said a third of the shares in Hudson Bay Oil & Gas are owned by the Hudson Bay Co. and two-thirds by Continental Oil Co.

The company seeking incorporation would transport liquid petroleum gases, produced through the processing of natural gas, from southwestern Alberta to the international boundary through a 41-mile line. The line would connect at the border with a pipeline system being built by Continental Pipe Line Co., a subsidiary of Continental Oil.

Oil Returns to Favor in Wall Street

• Brilliant third-quarter advance of 13.6% in earnings sparks the improved showing. Gain was made in spite of a small rise in over-all demand.

OIL COMPANY earnings for the first 9 months of this year were 5% higher than they were in the same period of 1959, and the gain is reflected in the shares' return to favor on Wall Street.

Earnings of 41 oil companies during the first three quarters amounted to $2,392,762,000 compared with $2,278,402,000 for the period a year ago, according to tabulations by Carl H. Pforzheimer & Co., members of the New York and American stock exchanges.

Of the 41 companies studied, 27 had higher earnings for the first 9 months and 16 recorded increases above the 5% industry average. All international companies in the report had higher earnings.

A big quarter . . . Key to the improved position is the startling gain during the July-September quarter when earnings jumped 13.6% above 1959 to a record high for the period.

These gains were achieved in spite of a disappointing increase in total petroleum demand of only 1.1%. Consumption had been expected to show a sharp increase over the same quarter in 1959 when business activity was crippled by the impact of a nationwide steel strike.

However, restrictive measures by state regulatory authorities—particularly the Texas Railroad Commission—held down crude production to a gain of 1.3% over 1959.

Although refinery runs gained 3.4% for the quarter, the refiners' gross margin shot up 15.6%. This was in sharp contrast to an 18.3% decline in gross margins in the first quarter and a 14% drop for the second quarter. The about-face reflects the stable level of crude prices and the sharp increase in product prices.

For the full 9-months' period total petroleum demand was up 1.9%, crude production off 0.8% and refiners' margins down 6.3%.

On the basis of the better earnings performance, several companies liberalized cash dividends.

For example, Amerada Petroleum declared a fourth-quarter dividend of 85 cents per share compared with 50 cents paid previously.

Texaco Inc. is among several firms which again are paying extra dividends. Texaco is paying an extra dividend of 25 cents per share, making 1960 payments $2.85 per share cash and 2% in stock. The return last year was $2.60 per share cash and a 2% stock dividend. Texaco had raised its quarterly dividend from 60 to 65 cents in March.

The Pforzheimer report noted that as a result of this improved showing, oil stocks once more are becoming popular with investors, if still on a selective basis.

Oil stocks the last half of this year have done much better than the market as a whole.

First 9 Months' Earnings

	1960 Net Income	1959 Net Income	% Change
Amerada Petroleum	$18,017,900	$17,563,407	2.5
Anderson-Prichard	3,863,364	4,866,719	- 20.6
Argo Oil Corp.	3,691,812	3,684,726	0.1
Ashland Oil & Ref.*	11,300,064	11,117,081	1.6
Atlantic Refining	27,405,000	25,429,000	7.7
Champlin Oil & Ref.	6,147,767	6,144,462	0.0
Cities Service Co.	26,538,590	27,301,746	- 2.8
Continental Oil Co.	45,435,000	45,330,000	0.2
Creole Petroleum†	153,590,000	153,297,000	0.1
Getty Oil Co.	6,286,432	5,881,336	6.8
Gulf Oil Corp.	237,910,000	216,475,000	9.9
Honolulu Oil Corp.	8,237,702	10,057,404	- 18.0
Imperial Oil, Ltd.†	46,756,000	37,680,000	24.0
International Pet.†	22,800,000	15,800,000	44.3
Louisiana Land & Expl.	17,101,666	14,136,325	20.9
Midwest Oil Corp.	4,898,643	4,964,071	- 1.3
Ohio Oil Co.	27,409,652	27,322,548	0.3
Phillips Petroleum	78,919,882	77,386,194	1.9
Plymouth Oil Co.	(298,999)	2,795,869	- 110.6
Pure Oil Co.	20,213,000	19,242,000	5.0
Quaker State Oil	1,360,583	1,763,149	- 22.8
Richfield Oil Corp.	20,775,603	18,189,423	14.2
Royal Dutch Pet.‡	216,827,520	213,121,440	1.7
Shamrock Oil & Gas*	7,203,417	6,949,186	3.6
Shell Oil Co.†	104,307,706	104,055,172	0.2
Shell Trans. & Trad.‡	144,551,680	142,080,960	1.7
Signal Oil & Gas	11,960,177	12,524,696	- 4.5
Sinclair Oil Corp.	34,503,715	34,570,711	- 0.1
Skelly Oil Co.	17,122,130	19,109,597	- 10.4
Socony Mobil Oil	135,900,000	123,000,000	10.4
S. O. California	199,255,000	180,115,000	10.6
S. O. Indiana	102,826,000	106,189,113	- 3.1
S. O. Kentucky	10,448,000	11,183,000	- 6.5
S. O. New Jersey	501,000,000	477,000,000	5.0
S. O. Ohio	17,573,940	17,959,360	- 2.1
Sun Oil Co.	34,851,548	32,150,590	8.4
Sunray Mid-Continent	29,078,000	30,783,000	- 5.5
Superior Oil of Cal.*	18,680,246	10,542,799	77.1
Texaco Inc.	278,984,048	261,854,030	6.5
Texas Gulf Producing	3,417,252	2,878,545	18.7
Texas Pacific C. & O.	5,758,759	5,182,568	11.1
Tidewater Oil Co.	31,351,000	27,832,000	12.6
TXL Oil Corp.	1,955,716	3,156,438	- 38.0
Union Oil of Calif.	23,721,266	19,900,408	19.2
Wilcox Oil Co.	579,071	667,899	- 13.3
Total	$2,392,768,000	$2,278,402,000	

*Fiscal quarter corresponding to calendar quarter. †Consolidated in report of parent company. ‡Figures based on 60% of Royal Dutch-Shell group of companies in the case of Royal Dutch Petroleum and 40% in the case of Shell Transport and Trading.

A Look at Turnpike Marketing

Gasoline Sales on Toll Roads

Toll Road	Miles	No. Outlets	Thousands of Gallons	
			1958	1959
Connecticut Parkways	66	10	6,736	4,531
Connecticut Turnpike	129	14	2,203	6,408
Florida Parkway	108	6	2,371	2,690
Indiana Toll Road	156	10	15,296	18,023
Kansas Turnpike	232	6	3,957	.....
Kentucky Turnpike	40	4	976	.....
Maine Turnpike	106	6	2,290	2,279
Massachusetts Turnpike	123	10	7,642	.....
Garden State (N. J.) Parkway	173	8	5,865	7,169
New Jersey Turnpike	131	13	20,096	21,900
New York Thruway	545	30	31,371	32,988
Ohio Turnpike	241	16	31,209	.....
Oklahoma Turnpikes	176	10	3,647	4,713
Pennsylvania Turnpike	360	26	42,721	44,370
Texas Turnpike	32	2	927	.....
West Virginia Turnpike	88	3	1,315	.....

New Toll Roads Are Attracting Marketers

• Competition for outlets on turnpikes now in the planning stage in five states can be expected to stiffen. Besides the prestige angle, national and regional marketers would like a bigger share of future toll-road sales.

AS NEW toll-road projects move through various stages of planning in five states, marketers are appraising the value of outlets on these pay roads in their over-all sales strategy.

Those who have been willing to pay the price in royalties for the privilege of operating turnpike stations are re-examining this slim-profit-margin business. Those who have lost out in bidding, winning fewer outlets than they would like or none at all, are refiguring their economics to prepare for another try.

The prospect of flying the company flag in such a conspicuous location, on an exclusive or semi-exclusive basis, has special interest for at least two groups:

. . . **Regional marketers** with ambitions to become national in their scope.

. . . **All marketers** with small coverage in the areas to be served by new toll roads who would like to grab a bigger share of these markets.

These groups can expect stiff competition from established marketers who, for defensive reasons if for no other, desire toll-road representation in keeping with their position.

The new toll roads . . . One or more toll roads are planned in Delaware, Maryland, Florida, Kentucky, and Oklahoma, for possible completion in 1962 or 1963.

Delaware and Maryland plan to build a section of Interstate 95 linking the Baltimore Tunnel with the Delaware Memorial Bridge near Wilmington. The $140-million project is being pushed as a toll road to complete it ahead of the slower schedule of the federal-highway system.

Florida will extend the Ft. Pierce-Miami Sunshine State Parkway 100 miles from Ft. Pierce to Orlando. The project will cost $55 million.

Kentucky has two projects in the works. One is a 120-mile extension of the Louisville-Elizabethtown Turnpike from Elizabethtown to Princeton, at a cost of $70 million. The other will run 43 miles from Winchester to Compton. Estimated cost is $30 million.

Oklahoma also plans two turnpikes. The first would extend from near Oklahoma City, the southern terminus of an existing toll road connecting with Tulsa, southwestward to the Texas border near Wichita Falls. The second would be a north-south route in the eastern part of the state to carry traffic bound for the Dallas, Tex. area. The projects would cost about $90 million.

Toll-road outlook . . . The future of toll roads, rather bleak 2 or 3 years ago, is now considered very bright.

Toll-revenue bonds, recently a drug on the market, have gained in esteem in the financial community. There are several reasons for the improved climate.

Of the numerous toll projects built since the end of World War II, only two are having serious trouble and face default. The West Virginia Turnpike, during the year ended September 30, earned only 64% of its interest requirements. The Chicago Skyway earned only 42% of requirements.

The 1952 Pennsylvania Turnpike extensions are meeting only half their fixed charges, but the rest of the Pennsylvania system is profitable enough to bail them out.

The Kansas Turnpike is earning 84% of fixed charges, an improvement over the previous year. With its reserves, however, the issue is not worrying bondholders.

Further stimulating the toll-road comeback is the willingness of states to back projects with special funds or guarantees. The aid has taken the

form of allocation of state gasoline taxes for partial-interest payments and agreement to bear maintenance costs, subject to reimbursement from toll revenues.

The lag in the federal interstate highway system is also spurring toll roads.

Marketing experience . . . There is wide divergence of opinion among marketers as to the worth of toll-road stations.

They like the high-volume business, but dislike the narrow profit margins or actual losses which may be incurred during an abnormally long buildup period. They differ most as to the advertising, promotional, or prestige value of being on the turnpikes.

Gasoline-royalty rates being paid thus far, on roads where the cost of facilities was borne by the lessee companies, range—at the lower end of the scale—from 1.03 cents to 2.76 cents a gallon on the Pennsylvania turnpike.

At the upper end of the scale, gasoline rates on the Oklahoma turnpikes range from 2.5 cents to 5.81 cents a gallon.

On toll roads where authorities have built the service stations, gasoline rates vary from 5 cents for some outlets on the Indiana Turnpike to 9.13 cents for some outlets on the Connecticut Turnpike.

In addition to gasoline royalties, suppliers also pay varying percentages of the gross on their own sales.

The wide variation in the amounts which marketers have been willing to pay for greatly coveted turnpike locations attests to the variety of attitudes toward this type of business.

(The highest Oklahoma gasoline rate, for an outlet built by the lessee company, exceeds the lowest Indiana rate for an outlet built by the Turnpike Authority.)

There is equally wide range in the degree to which marketers are satisfied with returns from toll-road operations.

Future bidding for outlets . . . Some marketers, in their anxiety to win representation, have won in previous bidding by embarrassingly wide margins.

Others, approaching toll-road stations with the same economic yardstick as a station on a free road, have found their thinking must be altered drastically if they expect to be in the running for future sites.

Although some have been disillusioned by the profit picture thus far, there is no indication that future royalty rates are likely to be any less dear. On the contrary, the prospect is for spirited bidding for any sites offered on a new toll road.

The usefulness of a toll-road station as a tool for strengthening, or introducing, a brand in a particular market is in itself enough to guarantee hot competition.

As a hypothetical case, consider Humble Oil & Refining Co.'s drive to expand marketing into all 50 states. Oklahoma is one of the states which Humble is just entering. The two proposed toll roads are certain to receive strong consideration as Humble charts its penetration into this new market.

Consider also, Phillips Petroleum Co.'s expansion in eastern states. Phillips, whose opinion of toll roads can be seen from its strong bidding on previous roads, could regard the Delaware-Maryland Turnpike as a good opportunity for expansion in that area.

Cities Service Co., the most aggressive of the majors in obtaining toll-road sites, has found that they can fit into company sales plans very well.

The list of brands on existing toll roads shows that some major marketers are in a minor position in this field. And some can be counted on to step up their efforts when future outlets come up for bid.

Texaco Gift Starts Cuban-Refugee Aid Drive

A FUND DRIVE among industry to aid refugees who fled to the U. S. from Castro's Cuba was kicked off in New York last week with a $100,000 gift from Texaco Inc.

Castro seized $55 million in Texaco assets last summer when he also seized refining and marketing properties of Shell and Jersey Standard, after they refused to refine Russian oil.

President James W. Foley of Texaco told the Journal he does not consider Texaco to be "a permanent refugee of Cuba. We expect some day to get back in and recover our property."

Who's Marketing on Toll Roads—and Where

WITH 38 outlets on nine turnpikes, Cities Service leads all other marketers in range of operations on toll roads.

Second highest: Esso, with 26 outlets on seven turnpikes.

Other marketers with outlets on more than one turnpike include: Texaco, 16 outlets, six turnpikes; Gulf, 14 outlets, three turnpikes; Atlantic, 21 outlets, four turnpikes; Phillips, 12 outlets, three turnpikes; Sinclair, 10 outlets, five turnpikes; Calso, 10 outlets, three turnpikes; Mobil, 10 outlets, three turnpikes; Continental, six outlets, two turnpikes; Shell, six outlets, two turnpikes; Pure, four outlets, two turnpikes.

Here's how the picture looks in a breakdown by turnpike, brand name, and number of outlets:

CONNECTICUT PARKWAYS: Calso 2, Cities Service 6, Crown Central 2.

CONNECTICUT TURNPIKE: Calso 2, Esso 4, Texaco 2, Tidewater 6.

FLORIDA PARKWAY: Amoco 1, Atlantic 1, Cities Service 1, Phillips 1, Sinclair 1, Texaco 1.

ILLINOIS TURNPIKE: Red Crown 10.

INDIANA TOLL ROAD: Cities Service 2, Pure 2, Shell 2, Sinclair 2, Texaco 2.

KANSAS TURNPIKE: Mobil 1, Phillips 4, Sinclair 1.

KENTUCKY TURNPIKE: Gulf 2, Texaco 2.

MAINE TURNPIKE: Cities Service 4, Esso 2.

MASSACHUSETTS TURNPIKE: Cities Service 4, Esso 2, Mobil 4.

GARDEN STATE (N. J.) PARKWAY: Atlantic 2, Cities Service 4, Esso 2.

NEW JERSEY TURNPIKE: Cities Service 13.

NEW YORK THRUWAY: Atlantic 4, Calso 6, Cities Service 2, Esso 3, Gulf 1, Mobil 5, Sinclair 2, Sunoco 2, Texaco 5.

OHIO TURNPIKE: Cities Service 2, Pure 2, Shell 4, Sinclair 4, Texaco 4.

OKLAHOMA TURNPIKES: Continental 3, Phillips 7.

PENNSYLVANIA TURNPIKE: Atlantic 5, Esso 10, Gulf 11.

TEXAS TURNPIKE: Continental 3.

WEST VIRGINIA TURNPIKE: Esso 3.

LPG Marketers Consider Line to Southeast

- It would be in direct competition with a larger LPG line planned by a Transco subsidiary. Market surveys only justify one line.

ALMOST on the eve of construction of an LPG pipeline from Houston to Danville, Va., a rival group has announced its interest in building a line to serve the same area.

A propane line 1,100 miles long is being "considered" by Warren Petroleum Corp., Phillips Petroleum Co., Union Texas Natural Gas Corp., and Tuloma Gas Products Co.

These four companies are the nation's leading marketers of LPG and would be among the principal shippers in the line also planned by Trans-Southern Pipe Line Corp., a subsidiary of Transcontinental Gas Pipe Line Corp., Houston.

Trans-Southern last week reaffirmed its plans for a $65-million 1,355-mile pipeline from Houston to Danville (OGJ, Dec. 5, p. 84, and Oct. 3, p. 66). Construction is scheduled to start in the spring. Pipe has been ordered, and right-of-way is being purchased for the portion of the route that does not follow Transco's gas system.

The rival proposal is for a main line of smaller diameter (8 to 10-in. as opposed to 12-in.) costing only $35 million. Capacity would be 25,000 bbl. daily compared to 60,000 bbl. daily for Trans-Southern. The routes would vary on the eastern section. (See map.)

The new proposal did not amount to a definite announcement of intention to construct the pipeline.

"Preliminary studies have been completed," the statement said, "and the companies have indicated their interest in participating in the construction and operation of the line, depending on final engineering reports."

In addition to Warren, Phillips, Union Texas Natural, and Tuloma, potential backers could include Humble Oil & Refining Co., Shell Oil Co., and Goliad Corp.

Which line? . . . The LPG producing and marketing companies disclaimed any intention of blocking construction of Trans-Southern, and Trans-Southern officials said their own plans to go ahead had not been altered.

Officials of the producing companies explained they had volume LPG production in the Gulf Coast region and good markets in the southeast and felt they should share in any profits from transporting their products.

Market surveys, however, do not justify more than one pipeline. Shipments, up to now made largely by rail, only recently have reached a volume that would justify a pipeline.

It would appear, therefore, that only one of the projects, or perhaps a combination of both, is warranted. Officials of the shipper group admit privately that present economics make only one line feasible but assert they have no intentions of merging their project with Trans-Southern.

Trans-Southern claims the advantage of a year's head start in planning and in right-of-way acquisition, plus a saving on right-of-way through use of its existing property for 90% of the LPG route.

Trans-Southern has gone so far as to install a 10-in. crossing of the Tombigbee River in Alabama. The installation was made in advance to realize savings possible by laying the LPG crossing at the same time as one for Transco's gas system.

Trans-Southern has letters of intent from several potential shippers, including some of the backers of the rival proposal. These letters simply state an interest in using a facility if rates are competitive and if it serves a shipper's transportation needs. They

are not binding. Pipeline experience has been that letters of intent do not always result in business after the line is laid.

Rival plans . . . Announcement that the LPG marketers are considering their own pipeline was interpreted as a move to pull the rug from under Trans-Southern.

Their business is considered essential to success of any pipeline serving the southeastern states. If they decide to build their own line, they can guarantee enough throughput to obtain financing.

Robert L. Topper, Houston, executive vice president of Trans-Southern, said his company intends to proceed on schedule with its own pipelaying plans.

Topper conceded it is unlikely both lines will be built but said he believed his line—not the other—would prove itself ultimately to be the better deal.

"I believe you will find that no decision has been made by these companies," Topper said. "They must do what is best for them competitively, and they are simply looking at a proposal for building this line another way."

Trans-Southern has set a tentative rate of 11.1 cents per barrel per 100 miles but has emphasized that this is a maximum figure and may well be lowered by the time the tariff is finally set (OGJ, Dec. 5, p. 84).

"As we said before, we feel we can do better than that," Topper said, "but we had to start somewhere. We have an existing pipeline and the right-of-way. With these mutual facilities and personnel, we don't think they can beat us. We can build this line for a cheaper price."

Shipper-owned line . . . The shipper group apparently disagrees with Trans-Southern as to the size of facilities that are necessary, and, to some extent, as to their location.

The shipper line is not nearly so ambitious, requiring only half the capital outlay. A spokesman for the group said that it is geared more closely to the present market.

Trans-Southern proposes to build into the original system capacity for future business which, when it develops, could be handled more economically in its larger line.

The shipper group minimizes the advantage of Trans-Southern's using existing Transco right-of-way. Right-of-way is not a major cost item, although it is substantial; and the routes do not coincide for the entire length of the pipeline.

The shipper group contends it could meet the same construction timetable and begin operation next winter.

watching WASHINGTON

Clyde La Motte

• All agree: Agency action needs to be speeded up . . .

THERE IS considerable talk in Washington about the urgent need to "do something" about the government regulatory agencies, such as the Federal Power Commission, the Federal Trade Commission, and others.

President-Elect Kennedy is aware of the problem. He has appointed James M. Landis, a former law-school dean who has served in several government agencies, to make a study and to draft proposals for needed changes.

And a Senate committee headed by Sen. John A. Carroll (D.-Colo.) has been holding hearings to seek suggestions for improving the functioning of the agencies.

It is a subject that has been kicked around for years. The spotlight was put on it last year when Louis J. Hector resigned from the Civil Aeronautics Board and filed a long report with President Eisenhower about the mess the federal agencies are in.

Since that time, Hector has been called on to speak before various groups interested in getting something done. Others, including bar association groups and members of the agencies themselves, have delved into the problem. At the FPC, for example, a great deal of effort has gone into devising ways to speed up the commission's operations.

• Delays grow longer as case backlogs keep mounting . . .

CHIEF CONCERN over regulatory agencies is the interminable delays. As the FPC itself said recently, even if the size of its staff were tripled the commission probably could not catch up on its workload before the year 2043. Other agencies have similar ever-increasing backlogs of cases.

Costs are a big factor, too. Going through all the red tape procedures to get a certificate or a rate hike not only takes a long, long time but it costs the applicant a great deal of money.

Perhaps the most exasperating thing of all is the lack of clear-cut policies by the agencies. This means that an applicant—and even staff members of an agency—must grope in the dark, with few or no guidelines. The absence of specific policies means that each case is handled through the same time-consuming, detailed procedure.

• Road to improvement likely to be long, winding . . .

THERE IS NO DEARTH of suggestions as to what might be done to improve the work of the federal regulatory agencies. Just about everyone seems to have a pet theory.

Hector, for example, proposes that the functions of the agencies be split. He would have the commissions authorized to set policies and make rules—an administrative role. And he would have special courts set up to decide major contested cases.

Others have suggested that the hearing examiners be upgraded and given more power, so that the commissioners heading the agency would be less involved in mechanics and detail.

FPC Chairman Jerome Kuykendall and others think the splitting apart of the agency's operations—particularly the setting up of special courts—would create more problems than it would solve.

Kennedy's man, Landis, did not outline many specific proposals in his appearance before the Senate committee. Instead, he talked in broad terms of the basic problems.

He did suggest that longer terms—perhaps 10 years—for commissioners would give them more independence and security and would slow the rate of turnover.

An observer gets the feeling, however, that regardless of the merit of a given proposal, any overhaul of the regulatory agencies is likely to take about as long as some of the proceedings before one of those agencies.

AUCTIONEER Wayne Somerville pleads for a good price on a mud pump at Liberty Drilling Co. auction.

Auction Bids Near Going Prices for Drilling

IF YOU'RE looking for an on-the-spot size-up of the drilling equipment business, go to an auction.

Auctions aren't entirely new to the industry, but they're becoming more frequent. Whether the seller gets what his equipment is worth is always debatable, but at least it sells—and he gets cash on the barrelhead.

In Houston, Liberty Drilling Co. went the auction route to liquidate its equipment. The sale drew 300 to 400 persons during the 1-day sale, and perhaps 100 of these were bidding on some 400 lots.

The star attraction of the affair was a 4-year-old Continental Emsco GB 500 rig with draw works, three engines, substructures, mast, Gardner-Denver FXG 172 pump. Bidding went to $55,000, the offer of C. B. Webster Drilling Co., Houston.

Dissatisfied with the price, Liberty's owner Rex Cauble asked the auctioneer to try moving it piece-by-piece. That method failed to produce $55,000—so Webster got the rig at his bid price.

Cauble also wasn't too happy with a $9,750 price he got for the three-engine U-15 draw works and $2,500 for the 127-ft. mast and substructure.

But for the entire day's sale, Cauble got a total of about $200,000—all in cash.

Comments varied on the prices bid. One observer said that, considering the saturated market in a period of slow drilling, the prices were in keeping with those elsewhere. While nothing went at a premium, virtually all the items had bidders who paid pretty much the going rate.

Auctioneer Wayne Cook, Dallas, has conducted two other drilling

CROWD at the auction ran to 400, but not all were buyers. Many equipment men were there to check prices.

A SALE is made on seven reels of wire.

Equipment

equipment auction sales in Houston in the past year. He said drilling firms which are liquidating are finding it easier to sell at auction rather than piecemeal.

He conceded that some pieces would sell at perhaps better prices at individual sale—"but what is the seller going to do with his cats and dogs?"

"Today we'll have all the money in the till for this equipment," he said. "Any other way, and you couldn't dispose of it over a 2-year period."

Cook was speaking strictly of company liquidation sales—but not necessarily "distress" sales. The Liberty sale, for example, was not a distress sale. Cauble was selling out so he could devote full time to his quarterhorse business.

The auctioneer said his method of selling equipment has brought no friction with supply houses. In fact, he added, some supply companies have indicated an interest in moving equipment themselves by auction.

Many supply men were present in the crowd at the Liberty sale, though none was bidding. Several were taking notes on what the equipment was bringing.

The sale drew bidders from as far away as Denver, and a number came from East Texas and South Texas. They were able to pick up a couple of mud tanks for $1,000 and $1,400 and a C-250 standby mud pump for $4,000. Such oddments as a 5,000-6,000-gal. butane tank went for $185.

Daniel Cites Perils to Oil

• Texas governor, new IOCC chairman, warns that shut-in burden threatens future exploration and conservation.

GOV. PRICE DANIEL of Texas, elected chairman of the Interstate Oil Compact Commission for 1961, told the organization's Phoenix meeting that three great dangers menace proper conservation.

He listed as threats: The increase of imports at a faster rate than domestic production, federal regulation of gas at low prices which give oil unrealistic competition, and the failure of some states to prorate oil production in line with demand.

Daniel said these factors create a depressed market for crude oil, contribute to the premature abandonment of stripper reserves, and discourage exploration and drilling.

He pointed out that crude production is no greater than it was 5 years ago and that the industry cannot afford to take proper conservation measures or hunt for new reserves if it has to carry the burden of 30% shut-in capacity much longer.

"In some of our major producing states which relate and limit production to market demand," Daniel said, "our conservation program is being criticized and attacked because of the imbalance in crude supply from all producing states. Some states have increased their crude production considerably during the past 5 years despite the fact that over-all demand for domestic crude has stabilized.

"I do not know how long the major prorating states can preserve what we think is an essential conservation measure to prevent overproduction and above-ground waste when other producing states ignore this measure of production controls."

The IOCC elected Dr. Walter Jones, Alabama representative, as first vice chairman, and Fred Moran, Kentucky representative, as second vice chairman. Lawrence R. Alley was reelected executive secretary and Earl Foster was reelected general counsel.

Foster announced that he will retire as general counsel at the end of 1961. Now 73, he served as executive secretary of the Compact from 1944 until 1957 when he became general counsel.

New Gas Plant Uses Old Idea

• Louisiana processing setup takes leaf from refiner's book—divides operations to get nearer to markets.

A NEW gas-processing plant opened recently in Louisiana uses an old refinery concept of production, refining, and marketing.

Gas liquids are recovered near their source in the field and refined into finished products near the market place. Usually, gas liquids are recovered and separated into their components at the same plant site.

The $13,000,000 gas-liquids plant system is owned jointly by Goliad Corp. and Union Oil Co. of California.

The extraction plant is at Cow Island in Vermilion Parish of Southwest Louisiana. The fractionation plant is at Riverside, on the east side of the Mississippi River, about 26 miles south of Baton Rouge. An 88-mile pipeline carries the gas liquids from Cow Island to Riverside.

The Goliad-Union system is the largest of its type in the U. S. and the first in Louisiana. Goliad supervised construction of the plants and is the operator. Sibon Pipeline Co., a Goliad subsidiary, operates the pipeline.

The system is significant for three reasons. First, it recovers valuable gas liquids not recovered previously from "lean" southwestern Louisiana gas. Second, it overcomes the natural barrier of the Atchafalaya Basin. Third, it puts the fractionation plant near a natural market for its products—the New Orleans-Baton Rouge area.

The extraction plant has an initial capacity of 450 million to 500 million cubic feet daily and recovers about 7,000 bbl. of products daily.

It processes natural gas from two major transmission gas pipelines, Transcontinental Gas Pipe Corp. and Trunkline Gas Co. Plans call for expanding capacity to 600 million cubic feet daily in 1961.

Transmission lines of these two gas companies cross at Cow Island. Gas from each pipeline is routed through separate absorbing towers to extract the gas liquids. Then the gas is re-

turned to the transmission pipelines.

The fractionation plant at Riverside has an initial capacity of 10,000 bbl. daily and is designed for expansion to twice this capacity. The plant will produce from Cow Island's daily flow of 7,000 bbl. of gas liquids about 3,000 bbl. of propane and nearly 1,000 bbl. each of ethane, normal butane, isobutane, and natural gasoline.

One advantage of locating the plant on the east bank of the Mississippi River is a tariff saving for rail shipments to the East of as much as ¾ cent per gallon, Goliad says.

The part of the Cow Island-Riverside line which crosses the Atchafalaya Basin was coated with concrete and laid in a canal from barges.

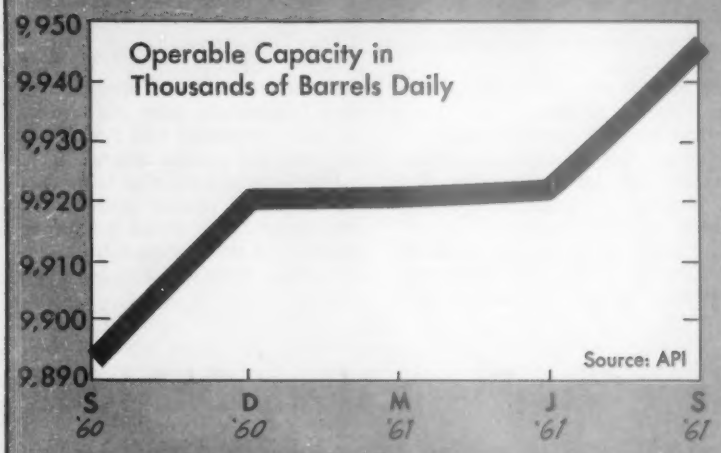
Union and Goliad also have leased 600 acres across the top of the Napoleonville salt dome as a possible location for storage wells.

The companies say that additional gas liquids from other extraction plants near the pipeline may be connected in the future.

U. S. Refining Growth Is Slowing Down

- A gain in capacity of only 0.4% by the third quarter of next year is shown in API survey. Biggest rise—32,000 bbl.—slated for District V.

How U. S. Refining Capacity Will Grow



Where Changes In Capacity Are Expected

Barrels Daily

Refining Districts	Sept. 30 1960	Dec. 31 1960	Sept. 30 1961
1. East Coast	1,511,600	1,509,100	1,509,100
Appalachian No. 1	112,650	112,650	112,650
2. Appalachian No. 2	113,000	113,000	113,000
Ind.-Ill.-Ky.	1,767,400	1,768,900	1,768,900
Minn.-Wisc.-No. & So. Dakota	138,000	138,000	138,000
Okla.-Kans.-Mo.	815,800	815,900	825,900
3. Inland Texas	400,700	400,700	400,700
Texas Gulf	2,224,700	2,224,700	2,224,700
Louisiana Gulf	783,500	783,500	783,500
No. La.-Arkansas	139,350	140,100	140,100
Rocky Mt.-N. Mex.	28,400	28,400	28,400
4. Other Rocky Mt.	347,150	347,600	363,600
5. West Coast	1,507,800	1,539,800	1,540,300
Total U. S.	9,890,050	9,922,350	9,948,850

U. S. REFINING capacity is growing at a snail's pace.

Projects now on the drawing boards will increase capacity by only 48,800 bbl. daily by third quarter 1961, according to the latest API survey.

The projected 0.4% gain in capacity lags considerably behind the 169,900-bbl. increase posted between September 1959 and September 1960.

Operable refining capacity now stands at 9,890,050 bbl. daily. This figure will increase to 9,922,350 by year's end and will inch upward to 9,948,850 bbl. daily by the end of the third quarter 1961.

The biggest gain will come in District V which is slated to add 32,500 bbl. of new capacity. This will bring the West Coast total to 1,540,300 bbl. daily, an increase of 2.2%.

The biggest percentage increase will come in District IV which is slated to jump from 347,150 bbl. daily to 363,600 bbl. by September 1961, an increase of 4.7%. About 450 bbl. of this capacity will be on stream by the end of this year with the remainder slated for completion during 1961.

The only decrease will be in the East Coast district which will drop 2,500 bbl. daily by the end of this month. With no construction scheduled, capacity is expected to remain at 1,509,100 bbl. daily through September.

Totals shown in the table do not include 64,000 bbl. daily which was shut down as of last September in need of major repairs. The total does include 474,500 bbl. of capacity which, while operable, was shut down last September 30. This operable capacity is believed to be in the high-cost marginal group.

The September 30, 1960, figures include about 106,050 bbl. per day which includes crude oil charged directly to cracking units.

The forecast, which is based on construction plans, has proven reasonably accurate when projecting over a 1-year period.

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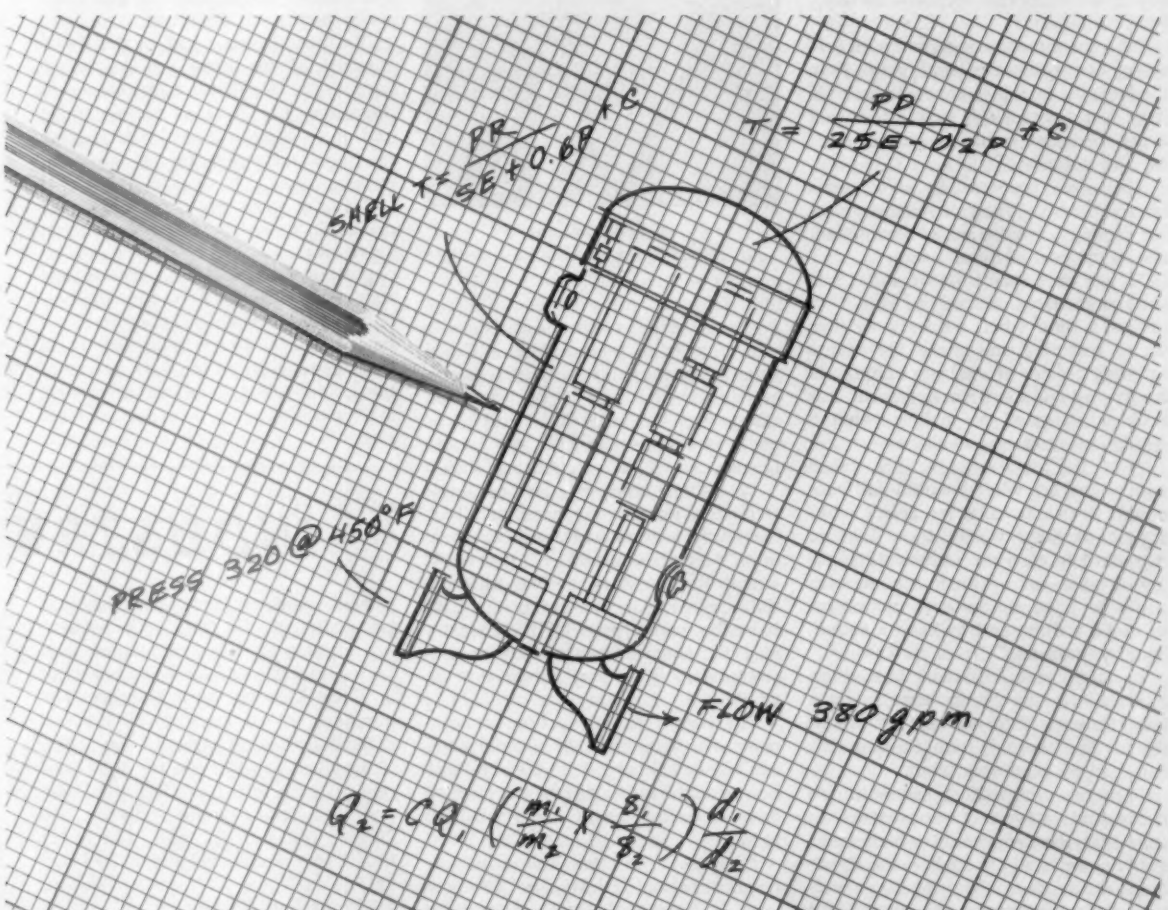

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McCollum Pleads for More Self-Regulation

• Conoco chief urges oil men to stop groaning about their plight and do something about it. He views too much productive and refining capacity as the major headache. His remedy: A diet of sound economic decisions.

THE CHIEF PROBLEMS of the oil industry are caused by the fact that management does not make the right economic decisions—and the cure is self-regulation.

This diagnosis and prescription was given by L. F. McCollum, president of Continental Oil Co., at the Phoenix meeting of the Interstate Oil Compact Commission.

Chiding his fellow executives for recounting their problems "like a bunch of economic hypochondriacs," McCollum said:

"We seem more concerned with talk about our bellyaches and pains than in doing something about them. We have lost sight of the simple fact that every problem contains within itself its own solution."

The main problem, he said, stems from excessive productive and refining capacity, intensified by a consistent rise in the cost of doing business.

"I am as uncomfortable in a hair shirt as the next fellow," he said, "but this is a time when we have to face up to our sins and place the blame squarely where it belongs. Until recently, oil-company management has been accustomed to making what I would call operating decisions.

"But the decisions we are faced with today are what I would call economic decisions, and we aren't making all of these wisely. . . . I know it is hard to turn the industry's thinking around on a dime, but we are going to have to do it if we expect to make a dime and to have a sound, healthy industry."

In the past decade, McCollum pointed out, the oil industry made a breakthrough into an age of abundance and there is danger that this can lead to economic waste.

"Today's competitive forces are so fierce and our profit margins are so slim that the temptation which faces every company is to look at the short-term rather than the long-range picture. If we continue to overproduce and overrefine we are violating the basic principle of conservation, which is wise and efficient use of our resources."

Haywire results . . . As an example, McCollum said that although the Texas Railroad Commission has held down production for some time, product stocks continue to be excessive.

L. F. McCollum
. . . uncomfortable in a hair shirt.

"Some of the same companies who were cutting back production in Texas simply bought more in other states and imported it into Texas," he said. "Does it make sense for Texas to be on a starvation diet and yet be importing oil from neighboring states?

"No single company, and no single state, can prevent the excesses which inevitably lead to waste and to opening a Pandora's box of evils that could wreck the industry as we know it today. State proration authorities have been the anchor men for the industry in 1960, and we have made some improvement. But they can't do the whole job.

"In regard to production, a company which operates in several states can't keep robbing Peter to pay Paul. In regard to refining, just because we have capacity doesn't mean we have to use it.

"We have to seek the economic balance between waste and competition. If my economic thinking is so fuzzy that I sacrifice long-term interests for a fast buck, then I don't deserve my job."

Bellwether group . . . The IOOC, said McCollum, is a fine example of self-discipline accomplished by finding facts, exchanging information, and using persuasion—all without violating law or sacrificing the principles of free competitive enterprise.

While the over-all organization comes close to perfection, he said, its implementing commission is not perfect. But it has demonstrated that it is perfectible. McCollum suggested that oil men take more advantage of the opportunity the commission offers for the analysis of industry problems.

"There are many ways in which the individual states could be improving their conservation practices and exercising better self-discipline.

"In fact, a great many of the shortcomings of the states are the industry's fault. We have fallen down in presenting the facts as we see them and in making recommendations to the regulatory agencies of the compacting states.

"Maybe some of us are glad the prorated states haven't been more aggressive, as this has given us an opportunity to play one game in one state and a different one in another. If we continue to do this, we'll all be the losers. The compacting states must depend on us for help, information, and enlightened self-discipline. We must depend on them for the same things."

INDUSTRY

Pan American Petroleum Corp. has bought Hondo Oil & Gas Co.'s working interest in 2,000 net acres with 10 wells in the Empire Abo reef trend in Eddy County, New Mexico. The purchase at an undisclosed amount includes Hondo's interest in three Pennsylvanian gas wells and five Abo-reef oil wells in the Chalk Bluff Draw unit, and two Abo oil wells on two 40-acre tracts to the east. The seven wells are producing about 340 net barrels daily; the three gas wells about 1,500,000 cu. ft. daily.

A lease sale scheduled for March has been postponed by the Board for Lease of University Lands in Austin, Tex. The board said the postponement was due to "unforeseen circumstances." Informed sources say it stemmed from recent heavy criticism by Jerry Sadler, who replaces Bill

Kline Sees New Area-Price Approach

• FPC commissioner says unrealistic political boundaries used in policy statement will be dropped. Gas prices may be set on a geological basis.

THE BEST solution to the problem of determining the proper price for natural gas at the wellhead is to free independent producers from regulation, in the opinion of Commissioner Arthur Kline of the Federal Power Commission.

Regulation is no longer needed and competition would soon take care of the problem because in some areas gas prices have already reached their competitive ceilings and could not go up much, Kline told the Interstate Oil Compact Commission meeting in Phoenix.

This is his personal view, however. He said that in its forthcoming annual report to Congress, FPC will renew a request it has made for the past several years for legislation that will permit it to regulate field prices on some basis other than the cost of service of individual producers.

In the meantime, the commissioner said, the new area-pricing policy recently announced by FPC is the best possible approach open to it under current law and court decisions.

Area pricing is going to involve almost as many problems as the now-abandoned cost-of-service method, Kline admitted. And he could not predict how the commission will solve them. He did, however, give these purely personal opinions:

Policy statement's intention . . . The prices listed in FPC's policy statement are not to be considered as proper rates to be charged. The statement is simply an announcement that prices may rise to those levels without further proof that they are just and reasonable. Some form of additional proof must be shown before FPC will approve higher prices, but the nature of that proof has not yet been determined.

The area boundaries set are not well suited to their purpose. It makes little sense to use political boundaries, but these were the only ones readily available and they have been used by FPC unofficially for some 18 months. FPC admits that the areas are unrealistic and is preparing to change them. It probably will adopt a geological instead of a geographical basis.

The best solution would be to have only four areas—Appalachian, Gulf Coast, Mid-Continent, and Rockies—but FPC probably will end up with a considerably larger number of pricing areas.

There is discrimination among districts, and FPC is trying to discover a way to eliminate this and to find a method that will not funnel exploration and development investment away from low-price into high-price areas.

The dual-pricing policy is under a severe attack by some. They contend that since FPC says it is taking the commodity approach, there is no sense in trying to set one commodity price for old contracts and a different one for new contracts.

This criticism is logical, but there are two sides to the problem and the commission had good reasons for dual pricing.

For one thing, industry recognizes the dual pattern and has different prices under old and new contracts. Also, FPC has the obligation to give consumers the lowest possible prices consistent with maintaining an incentive for the industry to develop new reserves, and it has not yet been established that high prices under old contracts are necessary to accomplish this. Thus it was decided that dual pricing is proper during the transition period.

Pricing in the future . . . FPC may get away from this dual pricing gradually. If it goes to a single price it may establish depth brackets within

BRIEFS . . .

Alcorn as state land commissioner January 1. Sadler has protested action of the leasing board and the Texas School Land Board in scheduling sales before he takes office.

Major expansion in the Grand Rapids, Mich., area has been made by Speedway Petroleum Corp. with agreement of Verbrugge Oil Co. to become a franchised distributor of Speedway products. The deal adds 18 retail outlets to the 12 Speedway stations already operating in the area.

Arkansas Fuel Oil Corp. has become a wholly owned subsidiary of Cities Service Co. The deal was completed upon delivery of a production payment of $70 million and $5,577,186 in cash to the court-appointed trustee for public stockholders who owned 48.5% of Arkansas Fuel. Purchase of the minority interest thus freed Cities Service from jurisdiction of the Public Utility Holding Company Act of 1935 and cleared the way for a corporate consolidation, starting with domestic oil exploration and production in Bartlesville, Okla.

Secondary oil recovery projects at Colorado's two largest oil fields are beginning to result in more crude production. State Oil and Gas Conservation Commission figures show Rangely field in Rio Blanco County is producing about 48,000 bbl. of crude daily, while Adena field in Morgan County is near the 22,000-bbl. daily mark. Water or gas injection projects are used at the fields.

Riffe Petroleum Co., Tulsa, has merged with Wilshire Oil Co. of Texas, a publicly-owned firm whose parent company is Britalta Petroleums, Ltd., Calgary. Riffe officials said the merger would not change the Tulsa firm's identity or operation. It specializes in marketing of asphalts, LPG, and other oil products.

Two Bureau of Mines reports on phase-equilibrium characteristics of nine helium-bearing gases have been placed on open file by the Interior Department. The information on the gases in various fields of the U. S. is expected to be useful to natural-gas companies and others considering participation in the Government's new helium-conservation program. Private industry is being encouraged to establish plants for extraction of helium from certain natural gases before they are burned as fuel.

A $111-million budget for new capital projects has been authorized by directors of Tidewater Oil Co. President George F. Getty II said expenditures against the authorization in 1961 will total $87 million.

the areas, with the deeper zones getting higher prices than shallow production. When final prices are determined for an area there may be a single price for both old and new gas, or there may be some sort of flexible formula to permit adjustments for costly new production.

The most troublesome problem, and the one on which no progress has been made, is the matter of hearings procedure and the type of evidence.

Cost evidence of some sort must be relied on. Not only is this required by court decisions, it is necessary to give some meaning to any finding of the commodity value of gas. Unless FPC actions have some sort of relationship to cost, there will be no regulation at all.

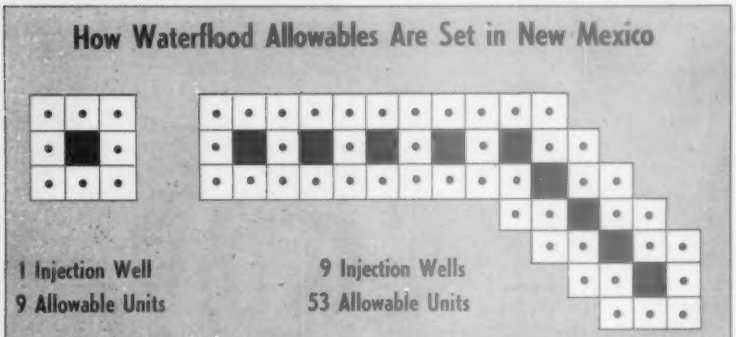
In any event, FPC must have dependable information as to the cost of developing gas reserves, the allocation of exploration and production costs between oil and gas, and the amount of return on investment needed by the industry to encourage expansion.

This cannot be determined from the books of an individual company. At times FPC has suggested that it wants industry-wide data and at other times it has suggested that it will be satisfied with a sample of a few selected representative producers.

It is not yet known which way the commission will go, but it may lean toward industry-wide data.

Hearing hurdles to remain? . . . New procedural rules are needed to prevent hearings from becoming three-ring circuses and running indefinitely. Whatever is done, the result probably will be that the hearings will be so long that there will not be many of them. This will tend to freeze area prices for long periods, once they are set.

A possible alternative is to write some flexibility into the order, such as providing an automatic change in prices in case certain things happen in the future.


How Waterflood Allowables Are Set in New Mexico
1 Injection Well
9 Allowable Units
9 Injection Wells
53 Allowable Units
These examples show some possible patterns of allowable units which include only producing wells completed in the same formation as injection wells.
The allowable assigned to a project area equals the ability of wells to produce, subject to a maximum for the area. This maximum allowable is determined by multiplying the number of proration units times the basic area allowable factor times the pool's depth factor.

Flood Proration Plan Hailed

. . . as boon to secondary recovery. New Mexico assigns its floods a big allowable but still under full capacity.

THE WAY New Mexico deals with water-flood proration could spark more secondary recovery at no cost to primary production or the search for new reserves.

This was explained to the Interstate Oil Compact Commission by Daniel S. Nutter, chief engineer of the New Mexico Oil Conservation Commission.

He said water flooding is doubling New Mexico's producibility and reserves.

Not long ago the volume of water-flood oil threatened to take most of the market from prorated wells on primary recovery. At that time water-flood-oil volume was subjected only to capacity proration.

About a year ago the Conservation Commission dug into this. It found evidence to back up "the engineering viewpoint that reasonable curtailment of production in water-flood projects does not result in loss of ultimate oil recovery."

The commission said lack of reins on water-flood allowables had hurt primary markets, and this helped cause a drop in primary exploration and development.

Agreeing that fairly constant injection rates are best, the commission set the water-flood factors at a uniform rate. The norm was based on the past history of allowables rather than shift-prone monthly allowables.

The factors involved are higher than current allowables. Explaining this, the commission said "the secondary recovery of oil by means of water flooding is desirable as a conservation measure and should be encouraged by a state-wide rule establishing allowables for such projects which are in excess of normal unit allowables but less than capacity allowables."

Water-flood projects subject to this rule are those in which enough water is injected into a producing zone to stimulate oil production from other wells in the area. Projects are limited to those areas in which wells are in an advanced stage of depletion and are considered stripper wells.

These allowable provisions apply only to projects authorized since the new rules were adopted. Often an old flood with the capacity-type allowable abuts against a new flood with limited allowables, so the rules allow special allowables in "buffer" zones and in other cases where correlative rights must be protected.

In applying the formula for setting water-flood allowables, the basic area allowable factor is determined by the previous allowable history for 40-acre units. This works out to 42 bbl. daily in Southeast New Mexico and 52 bbl. daily in Northwest New Mexico Extra credit of 0.333 times the basic area allowable factor is provided for the first three additional wells drilled on the proration unit.

Under certain conditions, water-flood projects may be expanded and additional wells placed on injection without the need for a hearing. Such action can be taken if the proposed injection well has received a response to the existing water-injection program, or if the proposed well is offset by a producing well that has received a response.

The new rules define a pressure-maintenance project as one in which fluids are injected into the producing horizon in an effort to build up or maintain pressure in an area which has not reached the advanced or stripper state of depletion. The allowable formula for such a project is fixed on an individual basis after a hearing.

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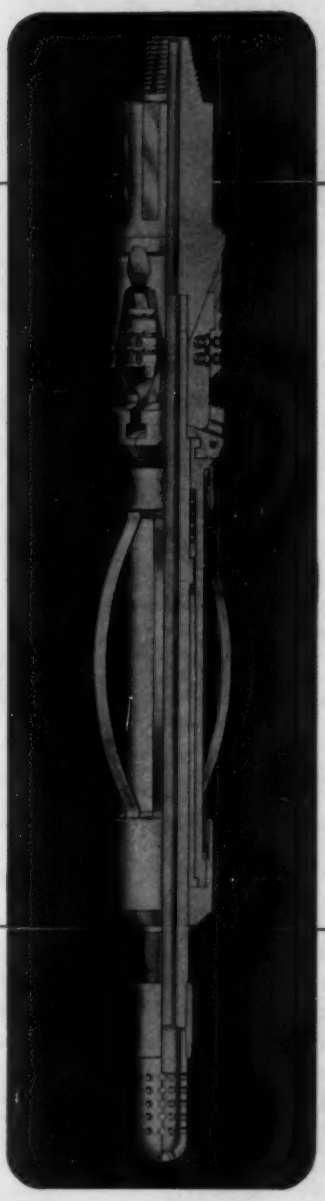

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- Eliminate rig time required for making up and breaking out long anchor pipe.
- Reduce possibility of sticking.

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Compact's National Proration Study Fizzles

THE Interstate Oil Compact Commission has abandoned an attempt to equalize national production by assigning a fair share of the market to each state.

It dissolved a special committee created 2 years ago to "study the equality of opportunity of oil production by the sovereign producing states." Instead, it directed its standing committee on regulatory practices to make continuing studies of oil laws.

The studies will cover operation of market-demand proration laws in states that have them and the need for such laws as a conservation tool in other states.

Thus the original effort to force curtailment of production in certain Rocky Mountain and Great Lakes states has become a project for research on the functioning of proration as an aid to conservation.

To start with, the reoriented project will collect figures on the extent of proration and the degree of exemptions in the states now prorating under market-demand statutes. This will provide a basis for comparison of producing rates in various states.

Recommendations to kill the special committee came from the committee itself.

A. L. Porter, Jr., secretary and member of the New Mexico Oil Conservation Commission, reported that the committee began with the idea of establishing a formula for dividing the crude-oil market among states. But when it couldn't agree on one, the committee concluded that even if an acceptable formula could be devised its use would be prohibited in many states.

The committee finally decided that this is not a proper activity for the IOCC anyway, but that it is proper and desirable for the organization to study market-demand proration as a regulatory practice.

Porter pointed out that in the early days of the IOCC, market-demand proration was a lively subject at every meeting. At that time, the issue was considered to be among the most important of the regulatory practices of the states with strong conservation laws. During the war the subject was virtually forgotten, and of the 25 states that joined the compact in postwar years only 2 have market-demand statutes.

He recommended at least two papers on proration at every IOCC meeting, and urged that the topic be studied continuously in order to educate states on the desirability of having such laws available for use when needed.

Paul R. Schultz, president of the Oklahoma Independent Petroleum Association, presented a sheaf of statistical tables and working papers to show the difficulty of determining the fair share of the market for any state or of even comparing the producing activities in various states.

These tables compared production with reserves, producing capacity, number of wells, prorated and unprorated wells, and similar factors. Schultz pointed out that these comparisons mean little without knowledge of still other factors such as well spacing, producing depths, stripper wells, water floods, and special exemptions from proration.

He said he had been unable to obtain such figures in many states, and suggested that the first task under the new project be the collection of such data.

Schultz said facts, rather than feelings, are needed on the subject of proration because there is no clear picture on how proration is working.

The IOCC should not try to force a decision on any state, he said, but when more knowledge is available satisfactory solutions probably will result.

Can Floods Be Prorated Without Danger?

• Yes and no, says the IOCC committee. In any case, the economics of any project must dictate the decision.

AFTER 7 years of controversy, there's still room for debate over whether a water flood can be prorated without damage.

A special committee of the Interstate Oil Compact Commission last week filed an inconclusive report and then disbanded itself.

In what was obviously guarded and compromise wording, the report seemed to say that the choice between a fast flood and a slow one is an economic matter.

It said, too, there is agreement that from a scientific standpoint the amount of ultimate recovery is not affected by the rate of flooding.

But it was silent on the question of whether a flood, once under way, can have its rate of production reduced without affecting future recovery.

The subcommittee, headed by George H. Fancher, Tulsa, submitted to the secondary-recovery committee a huge volume of technical reports collected over the years. It said all of them must be considered in any interpretation of the report.

It is expected that the main committee now will begin another study on methods used by states for limiting the rate of water-flood production.

In its official summary the subcommittee said:

... **Curtailment** of water floods is chiefly an economic problem, rather than a physical one. Curtailment affects the rate of recovery, and this may increase operating costs. And, oil production must cease when it becomes unprofitable.

... **At normal flooding rates,** the amount of oil which can be recovered by water flooding or a natural water drive is not affected greatly by the rate of recovery.

... **In the case of** some complex reservoirs, total recovery may be increased by a slow rate of flooding.

... **Lack of agreement** on the question of curtailing floods is due to lack of certainty as to reservoir characteristics. The mechanics of reservoir behavior are well known and can be used to predict performance. But there is often uncertainty over variations in a reservoir and over the distribution of certain properties of reservoir rock. This leads to uncertainty over the reservoir predictions and, therefore, over production economies.

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Southwest Refinery Runs Creep Up in October

- Small increase contrasts with drop in the rest of the country. And the southwestern refineries' operations rose to 87.8% of capacity.

REFINERY RUNS in the southwestern states climbed a notch in October.

The slight gain of 0.9% was opposed to a drop in runs throughout the nation. Nationally runs were 7,905,000 bbl. daily which was approximately 2.41% less than during the month of September.

The refineries of Arkansas, Louisiana, Mississippi, Oklahoma, and Texas accounted for about 40.8% of U. S. crude runs in October, according to the latest Journal survey of refinery runs. In the previous month the five-state area had runs equal to 40.6% of the national total.

For the nation as a whole, runs were maintained at about 80.8% of capacity during October. This was 1.4% less than the September figure. In the area covered by the Journal survey, which includes all states where individual runs are available from state regulatory bodies, runs were about 87.8% of capacity, an increase of 2.7% from the previous month.

Refinery Runs in Five-State Area

ARKANSAS

(Refinery Runs in Barrels Daily)

Company and location—	October	September	October 1959
Amoco, El Dorado	32,033	31,292	(*)
Lion, El Dorado	33,618	33,766	31,017
Macmillan, Norphlet	3,883	3,632	3,761
Other	5,725	5,478	5,466
Total Arkansas	75,259	74,168	40,244

*On strike.

LOUISIANA

(Refinery Runs in Barrels Daily)

Company and location—	October	September	October 1959
Cities Service, Lake Charles	165,018	165,052	175,093
Continental, Lake Charles	51,598	51,715	51,426
Humble, Baton Rouge	294,950	274,319	320,054
Ingram, Meraux	17,417	17,248	18,649
Shell, Norco	102,684	99,168	97,750
Tenn. Oil Ref., Chalmette	40,876	38,028	24,125
Other	8,151	7,833	8,941
Total Louisiana	680,694	653,363	696,038

MISSISSIPPI

(Refinery Runs in Barrels Daily)

Company and location—	October	September	October 1959
Paluxy, Yazoo City	1,679	1,682	1,100
Pontiac, Hattiesburg	16,123	15,703	13,064
Southland, Sandersville	3,971	3,777	4,200
Total Mississippi	21,773	21,162	18,364

OKLAHOMA

(Refinery Runs in Barrels Daily)

Company and location—	October	September	October 1959
Allied, Stroud	2,028	1,333	2,661
Anderson-Prich., Cyril	8,689	9,948	10,210
Bell, Grandfield	6,371	6,390	6,351
Ben Franklin, Ardmore	11,512	9,399	10,006
Champlin, Enid	25,566	26,499	25,513
Cities Service, Ponca City	29,077	31,576	29,129
Continental, Ponca City	67,409	67,013	72,037
DX Sunray:			
Duncan	40,525	40,198	38,911
Tulsa	71,502	70,312	70,406
Kerr-McGee:			
Cushing	17,752	19,001	22,546
Wynnewood	17,288	17,074	18,111
Midland Co-op., Cushing	12,975	13,038	13,322
Phillips, Okmulgee	13,073	14,043	15,216
Texaco, West Tulsa	33,097	37,708	39,046
Total Oklahoma	356,864	363,532	373,465

TEXAS

(Refinery Runs in Barrels Daily)

Company and location—	October	September	October 1959
Amoco, Texas City	122,032	127,034	90,680
Am. Petrofina:			
Mount Pleasant	13,719	15,506	14,880
Wichita Falls	7,079	6,799	8,059
Atlantic, Port Arthur	68,732	30,804	65,931
Col-Tex., Colorado City	7,661	7,621	12,718
Continental, Wichita Falls	12,703	12,825	11,209
Cosden, Big Spring	25,005	29,977	30,259
Crown Cent., Houston	34,596	34,459	35,189
Delhi-Taylor, Corpus Christi	38,804	34,199	33,469
Delhi & Mayfair, Port Isabel	1,459	1,139	6,272
Eddy, Houston	1,972	2,003	2,057
El Paso, Odessa	12,219	14,169	9,171
Gulf, Port Arthur	270,375	266,484	191,278
Humble, Baytown	273,675	286,614	282,791
La Gloria, Tyler	16,382	16,336	15,563
Mobil, Beaumont	195,454	196,106	168,727
Phillips:			
Phillips	54,826	54,032	63,207
Sweeny	55,534	58,332	77,956
Pontiac, Corpus Christi	47,093	48,133	45,403
Premier:			
Baird	2,965	3,031	2,131
Fort Worth	7,484	7,558	7,736
Longview	4,358	4,295	4,171
Pure, Nederland	71,946	75,118	69,566
Republic, Texas City	21,911	22,856	26,960
Shamrock, Sunray	24,620	24,240	23,126
Shell, Houston	106,073	108,144	105,396
Signal, Houston	49,498	48,357	50,756
Sinclair:			
Corpus Christi	28,085	27,362	30,532
Houston	108,138	125,031	125,226
Skelly, Longview	3,058	3,061	3,147
Southwestern, Corpus Christi	25,334	33,161	38,905
Stand. Tex., El Paso	46,068	41,092	43,986
Suntide, Corpus Christi	39,027	39,547	42,841
Texaco:			
Amarillo	13,341	16,347	14,117
El Paso	1,466	14,545	6,382
Port Arthur	261,293	238,266	212,501
Port Neches	40,838	40,723	38,284
Texas City, Texas City	28,564	27,129	26,499
Other	25,297	20,316	21,423
Total Texas	2,168,684	2,162,751	2,058,504

10 MILES OFFSHORE, Shell Oil's Platform Z pumps crude oil from the East Bay Field, working 24-hours-a-day, 7-days-a-week. PROBLEM: To insure continuous operation, with NO down-time, NO time-out. SOLUTION: Gates Super HC V-Belt Drive, with only 5 belts doing the work of 8 conventional belts. BONUS SAVINGS: $25.36 less drive cost, 33.3% less drive space.

or

130 MILES INLAND, The California Company's Raleigh Field operation requires 24-hour-a-day, 7-day-a-week flooding. PROBLEM: To eliminate possible sources of down-time and time-out. SOLUTION: Gates Super HC V-Belt Drive, with 3 belts doing the work of 4 conventional belts. BONUS SAVINGS: $74.97 less drive cost, 51.25% less drive space, 93 pounds less drive weight.

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GATES SUPER HC HIGH CAPACITY V-BELT DRIVES same hp capacity in smaller "package"

TGT Asks Approval for Segment of Huge Line

• First applications for the Texas-Mexico-California line are filed by Tennessee Gas and Southern California Edison. Construction plans are under way and the target date for completion is July 1962.

TENNESSEE Gas Transmission Co. and its potential chief customer, Southern California Edison Co., have filed their first applications on behalf of the controversial gas-pipeline project linking Texas to California by way of Mexico.

Each company made a filing with the California Public Utilities Commission for approval of the California segment of the 1,600-mile line.

Later, Tennessee Gas will go before the Federal Power Commission with applications to export gas from Texas into Mexico and to import gas from Mexico into California.

A third organization participating in the $225-million project is Petroleos Mexicanos, the Mexican Government oil agency. It will own the Mexican portion of the 30-in. line and furnish part of the throughput.

California Gas Transmission Co., a Los Angeles-based subsidiary of Tennessee Gas, asked the California PUC to authorize construction of 292 miles of pipeline and 10,000 compressor hp. for moving gas from the California border near Mexicali to Edison's generating plants near Los Angeles.

Edison simultaneously filed application with the PUC for permission to bring the Texas and Mexican gas into California. The line will have a capacity up to 455 million cubic feet of gas daily or about one-fifth the present gas supply for southern California.

Opposition primed . . . At least two companies already have indicated they will oppose any applications leading to construction of the line. They are Transwestern Pipeline Co., which recently opened its own 1,400-mile domestic line from Texas to California, and Pacific Lighting Corp., a California utility whose largest single customer presently is Edison.

Transwestern contends it can meet the requirements of the California market and another line is not needed.

Edison, however, is interested in obtaining an assured supply of gas at a stable rate over a long period of time, and believes the proposed new line will meet this requirement.

Edison said the target date for first deliveries is July 1, 1962. This means that approval of California authorities as well as the FPC must come during 1961.

No approval apparently is needed from Texas authorities to build the Texas segment and move gas across the Mexican line, although Tennessee Gas has not announced all the legal steps it will take to gain final approval for the project.

Construction plans . . . The company announced in Houston that it has formed a Texas subsidiary—Tennessee California Gas Transmission Co.—to build and operate the Texas segment of the line from producing fields of Humble Oil & Refining Co. to the Mexican border near Reynosa. Humble has agreed to furnish the bulk of the gas for the line.

William W. Witwer, senior vice president of Tennessee Gas, is the president of both the Texas and California subsidiaries and will direct construction and operation of the line.

In its application to the PUC, Tennessee Gas used U. S. foreign policy as an argument for approval of the two-nation project.

The United States, said the application, "is committed to a program of assisting the governments of Latin America in developing and strengthening their economies."

The pipeline project means the Mexican economy will benefit by an investment of about $165 million in the 1,200-mile Mexican segment. The Mexican steel industry will have a market for pipe.

Further, the Mexican petroleum industry will be stimulated by gaining a market for its gas reserves. And cities along the pipeline route will have an available source of gas for domestic and industrial use.

Summing up, the company said "the public interest of the United States will be served by binding together the economies of the United States and Mexico. The national income of Mexico will be increased and trade between the countries will be expanded."

Edison emphasized the benefits to southern California by the new supply of gas. The company would get a "stable price over the next 20 years—a price which we believe would be substantially less than we would otherwise have to pay."

The Los Angeles area will need greater gas supply because of smog regulations restricting industrial burning of regular California residual fuel oil for 6 months of each year.

According to Edison Vice President Robert P. O'Brien, the new line would give electric customers an assured supply of fuel to provide dependable electric service.

Arizona Ready

. . . for expanded oil and gas operations.

ARIZONA'S year-old Oil and Gas Conservation Commission has virtually completed its organization work and is ready to welcome oil and gas operators with a healthy climate for doing business.

This was reported to the Interstate Oil Compact Commission by D. A. Jerome, executive secretary of the Arizona body.

The commission—composed of a doctor, a lawyer, a rancher, a lettuce

PIPELINE

Movement of Canadian oil to Gulf's refinery at Toledo and Mobil's refinery at Trenton for the first time is encouraging Canadian producers to look with more favor on the Detroit-Toledo area. Gulf requested 5,000 bbl. per day for Toledo while Mobil requested 6,750 bbl. for Trenton in December. The amounts are enough to offset an expected decline in shipments to other Great Lakes refineries. They raise shipments to this area to 23,550 bbl. per day, 13.2% higher than in November.

Construction has been started by Pan American Gas Co. on a 50-mile system that will furnish natural gas to industries along the Houston ship channel. The first portion will connect Pasadena and La Porte and the second will tie in the Pasadena-La Porte line with Pan American's main

and cotton grower, and an entomologist—took over conservation work from the State Land Commission a little over a year ago. It has been educating itself and the citizens of the state about the kind of regulations needed when Arizona becomes an important producing area.

The state has only three producing oil wells plus a number of shut-in gas wells and high-gas-ratio oil wells which are not producing for lack of pipeline connections. But it has a fairly comprehensive set of conservation laws. In general, these laws follow the Compact Commission's model statute, including market-demand proration and a spacing pattern of 80 acres for oil and 640 acres for gas wells.

One formal order has already been issued requiring pooling in drilling units. Jerome said the hearing on the matter showed an urgent need for a field-unitization statute and the probability of need for a common-purchaser statute and for a ratable-take law.

The commission has begun the collection of geological information and maps, driller's logs, and cores, cuttings, and samples. It has helped set up courses in petroleum geology in the state university, and has facilitated the registration of petroleum engineers and geologists for practice in Arizona.

A new set of regulations has been circulated to the industry for comment and a formal hearing on them will be held at some time in the near future.

Firm Charts Big Expansion

• Houston Corp. plans include $7-million extraction plant and a hefty rise in Texas-to-Florida pipeline capacity.

THE Houston Corp., parent company for the Texas-to-Florida gas pipeline, has rearranged its financing to obtain a deferral on outstanding loans. Also it is planning an expansion of pipeline capacity for next year and construction of an extraction plant southwest of Jacksonville.

The company also named W. J. Bowen, Houston, as its new president. Bowen has headed its two subsidiaries (See p. 175).

At a directors meeting in New York, the company announced it had reached agreements with mortgage holders and banks that would avoid additional borrowing at this time.

The proposed construction program, which is separate from the current financial matters, would increase capacity of the pipeline system from the present 275 million cubic feet daily to 371 million.

The project is now before the Federal Power Commission for approval. If a favorable decision is handed down within the next 2 to 3 months, the work will be done in 1961.

Bowen said in Houston that a $7-million extraction plant for propane, butane, and natural gasoline will be built 45 miles southwest of Jacksonville when the new gas capacity is available. Sun Oil Co., he added, has advised Houston Corp. it desires to participate 50-50 in the project under terms of a long-standing commitment.

Houston Corp. organized Florida Hydrocarbons Co. last June to build the extraction plant on the 24-in. mainline of the gas system 3 miles north of Brooker in Bradford County, Florida. The site is in an area of high LPG use. About 20% of Florida's population is within a 50-mile radius.

The system will have a daily capacity of 2,150 bbl. of propane, 1,370 bbl. of butane and 1,050 bbl. of natural gasoline. The propane and butane would be marketed locally and the natural gasoline transported by tanker to an East Coast refinery for additional processing.

The new financing arrangements for the company and its subsidiaries call for three main changes. Holders of first-mortgage bonds and banks which have made loans will defer $10,740,000 in sinking-fund payments on pipeline bonds in 1961 and 1962, allow a $6-million bank loan maturing December 15 to be paid in three installments in 1961 and 1962, and extend a $10-million loan from a maturity date of December 1961, to January 1964.

BRIEFS . . .

line at Texas City. The company also is building an 8-mile line from the Hartburg field to boost its supply to industrial customers in the Orange, Tex., area.

The Stuart field in eastern Hughes County, Oklahoma, will be connected with the general system of Oklahoma Natural Gas Co. upon completion of a 14-mile 8-in. line now being built by the company. Target date for finishing the job is January 1.

Bids are being taken on a 70-mile, 8-in. jet-fuel line Southern Pacific Pipe Lines will build from Stockton, Calif., to Castle Air Force Base near Atwater, Calif. A contract is expected to be awarded in mid-December. An April 1 target date has been set for completion of the line.

An additional 47 miles of gathering lines is being laid by Lone Star Gas Co. to provide an outlet for 37 recently completed gas wells in Palo Pinto, Erath, and Stephens counties of West Central Texas. The company says the $750,000 system will hook into a 52-mile 18-in. line slated to be built from Springtown to Gordon, Tex., early next year. The new gathering lines will take gas under contracts covering more than 200,000 acres in the three counties.

First gas deliveries have been started by Gulf Resources, Inc., San Antonio, to Tennessee Gas Transmission Co. through a new $1,700,000 gathering system in Zapata and Starr counties of South Texas. The contract calls for average deliveries of about 50,000,000 cu. ft. daily. Completion of the system is expected to spur exploration and development in the prolific Wilcox zones between 7,500 and 11,000 ft. System operator will be Natural Gas Gathering Co.

Also for Pipeliners . . .

IN THE NEWS: Powerful group of shippers studies rival LPG pipeline from Houston area to Southeast competing with Transco project (p. 82) . . . Regulation of natural-gas producers no longer needed, says FPC Commissioner Arthur Kline (p. 89) . . . Approval sought for California segment of Texas-Mexico-California gas pipeline (p. 96).

PLUS THIS TECHNICAL REPORT: Shell keeps close check on controllable costs (p. 125).

Bid for Russia-to-Italy Crude Line Seen

• Mattei's visit in Vienna stirs speculation that he's actively working on a deal for pipeline delivery of Russian crude to Italian refineries.

A BUSINESS TRIP to Vienna by Italy's Enrico Mattei has prompted industry-wide speculation that the imaginative ENI head may be working on a deal to import Soviet crude via pipeline directly from Russia someday.

Mattei is actively promoting a pipeline from Trieste to Ingolstadt, Bavaria, a route which would cut across western Austria. This system would terminate at a new refinery which would supply Bavarian markets that Mattei hopes to develop.

The project is in competition with a plan by Jersey Standard and Royal Dutch-Shell for an Ingolstadt extension of the proposed Marseille-Karlsruhe system.

But Mattei is now trying to interest the Austrian Government in a branch from the Trieste line to Vienna. This section, from Carnic to Vienna, would open with an initial capacity of 60,000 bbl. daily.

Austrian crude production now supplies most of the demand of more than 50,000 bbl. daily. Despite declining output and growing consumption, observers see little need for additional delivery capacity to Vienna of 60,000 bbl. daily, notwithstanding rapid service-station construction in western Austria by AGIP, an ENI affiliate.

However, Vienna is only 40 miles from Bratislavia, Czechoslovakia, the terminal of the southern section of the 2,800-mile big-inch Soviet Comecon line from Second Baku.

This system will be delivering 300,000 bbl. daily to Poland, East Germany, Hungary, and Czechoslovakia by 1965.

The closeness of the Comecon outlet and the proposed ENI terminal has led to conjecture that Mattei may be working for a tieup of the two systems. Italy is one of the biggest buyers of Russian oil. Its purchases may average 115,000 bbl. daily over the next 7 years, including a new $200-million deal between Russia and ENI. A direct overland route might be considered advantageous by the Italians.

The most obvious drawback to this program would be relative transportation costs. Crude originating in the Kuibyshev area would not only have to be shipped 2,000 miles or more by pipeline—the last leg of the route would be across the Alps.

Expense also would be incurred in trans-shipping crude not processed at Trieste to other refining centers.

In contrast, the tanker trip from the Black Sea port of Batum to Trieste is only about 1,800 miles.

Tankers also can readily deliver crude anywhere along the Italian coast directly from Russia. And, a load will be taken off Black Sea terminal facilities when oil now moving from the Black Sea around Europe to East Germany, Poland, and Scandinavia is supplied more directly by the Comecon system, which will include a branch line to the Baltic Sea.

Venezuela Slaps Controls on Americans' Pay

VENEZUELA has extended its foreign-exchange controls over the wallets of foreign employes of oil companies.

The government is exerting the control through the voluntary action of companies, which have been asked to cooperate.

The result of the move is that American employes must cover their needs for bolivars by exchanging one U. S. dollar for three Venezuelan bolivars through a government bank. Employes could get more at a free-exchange rate. A weakening bolivar is now being traded for about four to the dollar in New York.

Oil Minister Juan Pablo Perez Alfonzo said companies had been asked unofficially to restrict the amount of dollars their employes cash on the local free market. He added that all firms had voluntarily agreed to comply for the "sake of good relations."

Dr. Perez Alfonzo said that under a "gentleman's agreement," foreign employes will have to cash U. S. dollars at 3.33 bolivars per dollar, the same rate as in the past. Employes will be permitted to keep some dollars in U. S. banks which they can sell on the free basis if they wish.

New employes will be assigned a percentage — based on past precedent—of the amount of funds they must exchange at the 3.33 rate.

Oil companies moved quickly to make the new rules stick. One of the largest operators has issued instructions to foreign employes to cash all personal dollar checks through the company cashier's office. The checks are to be made payable to the appropriate commercial bank.

Personnnel have been advised to keep records that will enable them to answer questions on the source of their bolivars. They also have been warned not to sell personal dollar checks to friends, individuals, or companies who may be in urgent need of funds abroad.

Underlying the government's move is an erosion of confidence in the country's economy. Revenue, largely from oil, has held up. But the government is spending over its head, and a foreign-exchange deficit of $180 million has been rung up so far in the current fiscal year.

This has led to a cheapening of the bolivar in relation to the dollar and has precipitated a flight of capital out of the country. The government controls are designed to restrict this flow of capital abroad.

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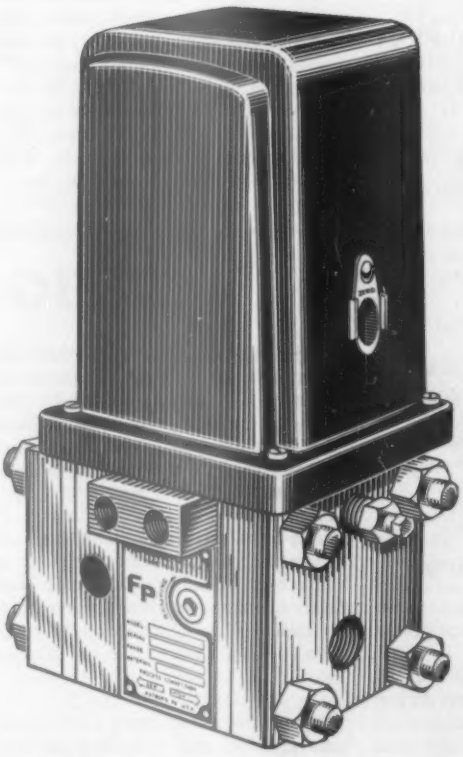

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Phillips Halts Maracaibo Work

• Drilling plans, work on flow station suspended while company reviews its Venezuelan development program.

PHILLIPS Petroleum Co. reportedly has deferred further capital expenditures and development on the valuable Lake Maracaibo properties, Blocks 10 and 17, it operates for a syndicate of American firms.

The clamp on spending was ordered until management can review the Venezuelan program.

Immediately involved are a drilling contract with Kerr-McGee and plans to build a flow station and 14-in. pipeline in Block 17. Chicago Bridge & Iron Co. holds contracts for special tanks, the flow station, and the pipeline.

Two major factors are back of the decision:

... Lower production — The government-imposed quotas on production and its ban on price discounting has held down crude output and limited markets. The result is a less profitable operation.

... Increased costs—With production off, costs become more important; and Phillips' attempts to lower them by a unitized operation with Shell so far have failed. One of the stumbling blocks to unitization is Phillips' and Shell's failure to agree on the effective date of unitization.

Phillips wants the effective date to be when the agreement is signed. Shell wants it to be the date of discovery. At the end of October Phillips had produced a total of 21,600,000 bbl. from its blocks and Shell 8,600,000 bbl. Under Shell's plan its production from the unit would be greater until the total take from the two blocks was evened.

Phillips will hold up new wells for a while and continue transporting its production by barges to a Creole terminal for handling. It may resume the development program when the economic climate clears over the lake.

Gulf Maps Danish Refinery

. . . with capacity of 1.5 million tons annually. Plant will have a full range of products for Scandinavia.

GULF Oil Corp. will construct a refinery at the seaport city of Stigsnaes in Southwest Zealand, the Danish island on which Copenhagen is located.

Gulf expects the refinery to be completed in 1962. Capacity will be 1.5 million tons per year (30,000 bbl. daily), and the output will move into Gulf's Scandinavian market.

Gulf did not disclose the source of crude for the refinery, but said "continuity of operation" is assured because of the company's wide diversity of crude supplies in the Eastern and Western Hemispheres.

Paul Siecke, who was named manager of Gulf's refinery at Cleves (Cincinnati) in 1959, will manage the refinery at Stigsnaes. He is a 28-year Gulf veteran.

Gulf said it selected Stigsnaes for the refinery because of its "excellent harbor" that can handle large tankers.

Gulf had announced that it would build a plant in either Denmark or Sweden, and took options on sites in both countries.

Royal Dutch-Shell is considering a plant in either Denmark or Norway. Final decision on a site has not been made, but the company has an option on some land near Frederica in eastern Jutland.

In other recent Scandinavian developments, Tidewater Oil Co. has started construction on a 20,000-bbl.-daily plant at Kalundborg, a port on the western side of Zealand (OGJ, July 27, 1959, p. 118).

The Danish refinery is Tidewater's first in Europe. In 1958 the company dropped plans for a plant at Rees in the Rhine River area of Germany. At the time, industry reports were that Tidewater abandoned the project because of tightening fuel-oil markets.

BP Refineries Expanding

BRITISH PETROLEUM is expanding its European refinery facilities in three separate projects.

A 100,000-tons-per-year asphalt plant will go into operation during the first half of 1962 at Lavera refinery, a 104,000-bbl. plant operated by BP's French affiliate, Ste. Francaise des Petroles BP.

The affiliate also is increasing the capacity of Dunkirk refinery by 11,000 bbl. through adaption of existing unused equipment. When the program is completed early next year, throughput capacity will be 52,000 bbl. daily on a mixture of Middle East and Saharan crude.

In Italy, a 4,000-bbl. catalytic reformer will be completed in mid-1961 at Porto Marghera refinery, near Venice. The 36,000-bbl. plant is owned jointly by BP and AGIP, an ENI company.

Field Off Honshu Producing

COMMERCIAL production has started in a new offshore field in the Sea of Japan off northwest Honshu's Akita Prefecture.

Three wells in Tsuchizaki oil field have been put on commercial production with output moving to shore through a new 1.4-mile submarine pipeline.

Japex has not disclosed production rates. But work on the submarine line started after Tsuchizaki 3 made 1,800 bbl. daily on test.

The three wells were drilled from one platform. Three more wells from a second location will go into production in the spring when the weather clears and pipe-laying operations resume.

No. 5 flows 130 bbl. daily through a 15/64-in. choke from 1,980-2,100 ft. No. 6 makes 380 bbl. daily through a choke of the same size from 1,820-2,060 ft.

Japex also has confirmed an offshore trend in Sarukawa field with the completion of Sarukawa 16, a directional well drilled into the Sea of Japan.

FOREIGN

Agreement has been reached between ENI and Ghana for construction of a $20-million, 24,000-bbl. refinery at Tema, a new West African port 16 miles from Accra. The plant will be designed for later expansion to 40,000-bbl. capacity.

Approval of a 3,200,000-acre oil concession in the eastern part of Southeast Australia's Murray River Basin has been granted to Overland-Australian Oils, Ltd., a subsidiary of Overland Industries, Inc., of Dallas, Tex.

Pemex has inaugurated a new products pipeline and a natural-gas line from Monterrey to Gomez Palacio, in the state of Durango. The 214-mile 10¾-in. products system will deliver

Submersible Hoist Licks Tanker-Hose Problem

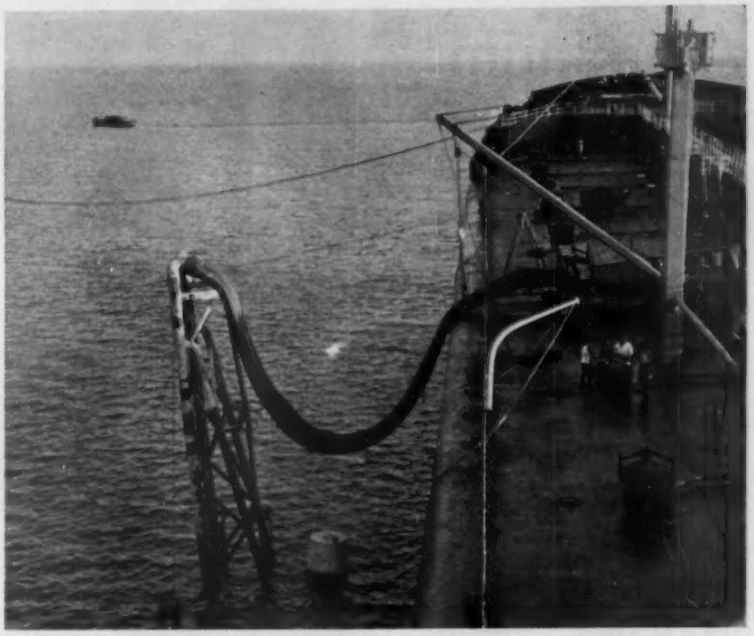
AN UNUSUAL "sea monster" unloader will enable Stanvac to supply its new Philippines refinery directly from tankers as big as 100,000 tons.

The device is a Hartley hose hoister, the first of its kind installed anywhere in the world to receive tanker cargoes. It was built to overcome special harbor conditions in Manila Bay, where the 25,000-bbl. refinery is going into operation on Bataan.

The water in Manila Bay is deep enough for giant tankers. But a pier long enough to handle the vessels would be far too costly. Normally, in such a situation, a submarine line is installed with a standard flexible hose attachment at the sea end. This lies on the bottom with a buoy marking its location. A tanker making delivery lifts the hose by means of the buoy line.

The bottom of Manila Bay, however, is covered with 30 ft. of ooze. Flexible-hose terminals of a submarine line would be lost if left in the deposits. One engineer said "they would just disappear in the ooze, and you could spend any amount of time trying to fish them out."

So, Stanvac has installed a trussed boom. One end is hinged to a platform submerged 60 ft. below the surface and anchored by piles driven into solid bottom. Air tanks are attached to the boom, and when these are filled with air the boom lifts its head above the surface like a fabled sea monster coming up for air. Four 12-in. sea hoses dangle from the head. These are coupled to the tanker's discharge manifold, and take crude which is delivered to shore via a 28-in. submarine line buried deep in the ooze.



SUBMERSIBLE HOISTER, holding aloft four 12-in. lines, juts out of the waters of Manila Bay during the first tanker delivery of crude for Stanvac's new Bataan refinery.

When the cargo is delivered, the air is released by shore controls, and the 100-ft. boom sinks out of sight.

Some buoyancy remains in the tanks at the horizontal position to ease the load on the platform. The equipment will be able to receive crude at 50,000 bbl. per hour.

Stanvac expects to supply the plant regularly later with an 87,000-ton tanker which will be ready in 1961.

In case of a surprise storm, special couplings will enable a tanker to "cut and run" from the mooring in 10 to 15 minutes.

A similar hoister was installed in Kuwait, but it has not been used since the construction of a new pier. It was used to load, rather than discharge, visiting ships.

BRIEFS . . .

about 16,000 bbl. daily for distribution in the states of Durango, Coahuila, and Chihuahua. The line was built in 18 months at a cost of $6.8 million.

A 20,000-bbl. refinery will be built in Nigeria by British Petroleum and Royal Dutch-Shell. The $33.6-million plant, which will start operating in the Port Harcourt area in 3 or 4 years, will handle local crude produced by Shell-BP Petroleum Development Co. of Nigeria. A new company, BP-Shell Petroleum Refining Co. of Nigeria, Ltd., will build and operate the plant.

Both of Russia's biggest tankers are delivering oil from the Black Sea to Cuba. The 40,000-ton Peking has returned to service after repairs of bow damage sustained in a Mediterranean collision in July. The Warsaw, of the same class, has been in service since September.

Acetylene production at a new plant to be built by Kyowa Gas Kagaku Kogyo K. K., a subsidiary of Kyowa Hakko Co. and Nippon Mining, in Niigata, Japan will be 27 metric tons per day. Natural gas will be the raw material and off-gas will be used to produce 100 metric tons daily of methanol.

Three widely scattered and remote wildcats are either getting started or drilling ahead in African programs in which the British Petroleum group has half interest. In Southeast Algeria, Ste. Saharienne de Recherches Petrolieres has started Amasralad 1. In northern Senegal, an affiliate has completed Nema Ding F-1 and is rigging up for a test on the western tip of the country in Soloum Delta. Another associated company, operating in Gambia, is drilling Sara Kunda 1 near Bathurst.

A gas-oil desulfurization plant with a capacity of 6,000 bbl. daily has been placed on stream in Antwerp, Belgium, by Raffinerie Belge de Petroles, S.A. The plant is the first of its kind to use a refining process developed by the French Petroleum Institute.

Arabian American Oil Co. has completed a crude-oil line and an LPG line to Ras Tanura. The 17.4-mile crude line, 34 to 36 in. in diameter, connects the Qatif Junction and Ras Tanura and the 6.5-mile, 6-in. LPG line delivers products from the Ras Tanura refinery to the terminal.

Aluminum drill pipe passes first test

Final evaluation still ahead. Price still uncertain.

NO KID-GLOVE TREATMENT was given the aluminum drill string. It was handled in exactly the same manner as steel pipe. At the conclusion of the 10,400-ft. well, there were no unusual slip marks, tong marks, or abrasions on the aluminum.

THE FIRST commercial string of aluminum drill pipe has dug its first oil well.

At the time of this writing, the string had been at work 35 days while drilling a 10,400-ft. hole for Shell Oil Co. in the Yorktown area of South Texas.

No one connected with the test—Shell whose rig handled the pipe, nor Reynolds Metal Co. which rolled the pipe, nor Reed Roller Bit Co. which made the tool joints—regards the first well as conclusive in any way. All emphasize that only after the string is completely worn out can they compute its cost per foot of hole drilled. Only then can a final comparison be made between aluminum and steel as drill pipe.

Nevertheless, the first test is significant. If no advantages of aluminum show up on the first test, they likely never would materialize. This much is evident after the first tests:

1. Shell's Rig 25 drilled easily to 10,400 ft. with the aluminum. It had never been able to drill effectively below 8,000 ft. before.

2. The aluminum pipe itself showed no damage from normal handling with slips, tongs, and elevators. The crew was under no instructions to handle the pipe carefully.

3. There was no apparent damage from corrosion or pitting. The mud in use was not of high pH, never exceeding 9.

4. In spite of the slightly smaller inside diameter of the aluminum pipe, pump pressures with it were not quite so high as with 4½-in. steel pipe.

There are, of course, many questions remaining which only time can answer:

BY ED McGHEE
Drilling Editor

1. What will service life be in normal service?
2. How will high-pH muds affect service life?
3. Will continued service roughen the internal surface and cause a rise in pump pressure?
4. Will there ever be failures in the connection between tool joints and drill pipe?
5. Will the limberness of aluminum ever become a problem?
6. Can rig costs be reduced by faster handling?
7. How much lower will moving costs be with aluminum pipe?

What will it cost? About the biggest of the unanswered questions is: "How much will a string of aluminum drill pipe cost?" The answer likely won't be soon in coming. Reason: The manufacturer can't compute his own costs until he knows how big the market will be. Reynolds officials, however, are confident that their final price will be low enough to create a demand.

Cost of tool joints will be easier to fix. The joints used on Shell's trial string are quite similar to those used to connect steel tool joints to steel drill pipe. Reed has been marketing these shrunk-on joints for a number of years.

Drillers are quick to point out that purchase price is not the only basis on which aluminum drill pipe will be judged. Rather, length of service life and expense of upkeep must also be considered.

Shell paid for the string of pipe it is using on Rig 25. Actual purchase price has not been announced. Reynolds is presently trying to interest other producing companies in buying aluminum strings on a similar basis.

Reynolds Metal officials say they realize that the drilling contractor will be extremely cautious in putting out

money for a complete string of aluminum pipe just as he would for any new and unproved product. For this reason, the company is considering a rental plan. Reynolds reasons that if the contractor rents aluminum pipe for several jobs, he may gain enough confidence to buy a string of his own.

The Shell string is roughly the same size as 4½-in. steel drill pipe. Reynolds says it plans to roll 3½-in. and other sizes as demand appears.

From alloy stock. The pipe is rolled, Reynolds reports, from an alloy of aluminum selected for its toughness and suitability for drilling service. Exact content of the alloy was not disclosed. The aluminum tubes themselves do not have the same wall section throughout their length. Rather, the walls are thicker on the ends than in the middle. The extra metal on the ends is intended to add sufficient strength to prevent trouble where the tool joint is attached.

The thick-end tubes are not upset in the same way that steel tubes are. Steel pipe is, of course, rolled with uniform walls and the upsets are forged on later. The aluminum tubes come from the rolls with their upset "built in."

The Shell string, while the first made commercially, is not the first aluminum drill pipe to see service. Several years ago, Reynolds "handmade" a 500-ft. string in 20-ft. joints. This string was tested in drilling shallow gas wells on the company's properties in Arkansas; it toted up more than 60,000 ft. of hole. Recently, this string was taken out of service so that its condition could be analyzed.

Table 1

PHYSICAL PROPERTIES OF ALUMINUM, STEEL DRILL STRING

	Experimental Aluminum Drill Pipe 4½-in.	API Standard 4½-in., 16.60-lb. Grade E Drill pipe
Outside diameter, in.	4.650	4½
Inside diameter, in.	3.615	3.826
Wall thickness, in.	0.517	0.337
Weight per foot with tool joints, lb.	11.20	17.90
Weight per 30-ft. joint, lb.		
in air	343	536
in 10-lb. mud.	218	455
Ultimate length to yield strength, ft.		
with no collar load hanging in air	34,100	18,500
with no collar load hanging in 10-lb. mud.	53,600	21,800
Torsional strength, in.-lb.	467,000	480,000
Collapse pressure, psi.	10,300	8,300
Internal yield pressure, PSI.	11,600	9,800
Minimum tensile yield, lb.	388,000	330,000
Fatigue endurance, million cycles on rotating cantilever at 150,000-in.-lb. moment	0.8 to 1.5	0.5 to 0.8

SHRUNK-ON TOOL JOINTS are applied to the aluminum pipe at Reed Roller Bit's plant. The joint is specially designed for service on aluminum pipe but is generally like the shrink-grip tool joints used successfully for years on steel drill pipe. These joints may be put on, or taken off, the aluminum pipe at the rig.

How strong is it? Reynolds says that it sized the aluminum tubes to be of equal strength in torsion to steel tubes of the same diameter. When its walls are thick enough for the needed torsional strength, the aluminum proved to be greater in strength in tension, collapse pressure, and internal yield pressure. Table 1 summarizes the strength properties of the aluminum pipe.

In Shell's string, inside diameter is smaller than on 4½-in. steel drill pipe. In spite of the smaller bore, Reynolds says that it takes less pressure to pump mud through the aluminum than through the slightly larger steel pipe. Reason, the company reports, is that aluminum is smoother and less pressure is lost from friction.

Reynolds officials say that a highly alkaline mud can reduce the service life of their pipe. The company has not, however, fixed the exact alkalinity, or pH, which marks the line between safe use and shorter life. Reynolds metallurgists say that a pH of 10 causes no immediate harm. At higher values of pH, there may be more frequent instances of failure as a result of corrosion fatigue.

In Shell's Yorktown well, the aluminum string suffered no apparent surface damage as a result of rotating against the formations in the hole.

ALUMINUM DRILL PIPE, the first commercial string ever rolled, lies on the racks of Shell Oil Co.'s Rig 25 in South Texas. Here, before being run in the hole, the aluminum color is apparent; later, after drilling in the hole, the pipe could not be distinguished from steel.

Rubber pipe protectors were run on the string, but their purpose was to protect the casing from the tool joints, not to protect the aluminum pipe from abrasion.

There were no abnormal marks on the Shell string caused by tongs, slips, or elevators.

How much lighter? Light weight is, of course, the big advantage of aluminum. Just how big is the advantage? Shell's experience may give a partial answer. The company's Rig 25 is rated to drill 7,500 ft. with conventional drill string. When the rig attempts drilling below this mark with steel pipe, the drill-pipe string itself is so heavy that the draw works cannot handle enough drill collars in addition to make hole effectively.

With aluminum drill pipe, the string was light enough that plenty of drill collars could be run to drill effectively down to 10,400 ft. The well could have been carried deeper if necessary.

A 30-ft. joint of the aluminum pipe with tool joints attached weighs 343 lb. in air. A steel tube (Grade E) with tool joints weighs about 536 lb. in air.

The difference in weight is even more marked when the pipe is immersed in the mud in the hole. If the hole were filled with 10-lb. per gal. mud, the rig's weight indicator would show only 218 lb. extra each time that a joint of the aluminum pipe was added to the string. Each joint of the steel pipe would add 455 lb. to the weight-indicator reading.

Reynolds claims that a rig which can hoist 10,000 ft. of steel drill string can just as easily pull 16,000 ft. of aluminum pipe.

It is plain, then, that completely successful aluminum drill pipe would have a great impact on the drilling industry. Every draw works would suddenly be uprated 50%. Of course, the rig's pumping plant wouldn't be uprated along with the draw works, but bigger pumps and engines can be bought cheaper than bigger rigs.

The aluminum-pipe experiments haven't caught the steel companies asleep. These firms, which have made all drill pipe until now, say they can lighten their own product. Their plan is to roll stronger steels so that thinner walls can be used. In fact, there are several strings of extra-high-strength steel pipe already in the field. Some of this pipe has a tensile yield strength of 140,000 psi.—almost twice the strength of Grade E drill pipe. Two or more such strings have been under test in actual drilling wells for 2 years or longer.

The steel companies predict that when there is a demand for the 140,000-psi. pipe, its cost will be only about 25% more than Grade E pipe.

Editor's note. Two major producing companies have cooperated with the editorial staff of The Oil and Gas Journal to bring you this exclusive evaluation of the Mark II unit pumper. It is assumed that the tests were carried out under unbiased conditions, that data were recorded as accurately as possible, and that the entire operation was approached in an engineering manner.

Editorially, we have done nothing more than put the data in article form rather than in the form of a formal report.

The two companies agreed to release this information if they and the manufacturers of the "Brand X" units remained anonymous. We are happy to comply with that requirement.

TWO MARK II UNIT PUMPERS on a dually completed well. The over-all different appearance is due to the modified geometry, which makes this a Class III lever system. Fig. 1.

What operators learned from competitive pumping tests

- That different silhouette you may see in the oil patch probably belongs to a Mark II unit pumper.
- Major operators that have tested the unit so far feel that the geometry responsible for the "new look" may be a step in the cost-cutting direction.
- Tests show that the unit produces the same or more oil with a smaller prime mover.

TWO MAJOR producing companies have tested the Mark II unit pumper.

Not just ordinary tests, but head-to-head comparison tests involving the Mark II and "Brand X" units. This should really be Brand X and Brand Y, because the conventional units used by the two companies were made by different maunfacturers.

Data made available to the Journal consisted of a copy of a complete report in one case, and the data table and curves from a company report in the other case. These will be covered one at a time.

The Mark II unit pumper is a product of Oilfield Equipment Corp., Denver.

The operating characteristics of the unit have been made possible by the rearrangement of the components of a conventional pumping unit. This modification resulted in a unit with a Class III lever system, crankshaft counterbalance, and a forward position of the transmisssion, Fig. 1.

The manufacturer claims that the acceleration - deceleration characteristics of the unit result in a smoother operation with lower peak loads. Lower peak loads mean lower torque, and smoother operation means more uniform torque.

The unit features adjustable stroke length, and is available with automatic or semiautomatic counterbalancing systems.

Company "A" Report

This report covered tests on the Mark II and a conventional unit over a period of several days. The conventional unit, already in place, was tested first.

During October 1959 the conventional unit was operated, under test, for 207 hours. It was an API 114 unit equipped with a 25-hp. motor. Before starting the test the unit was carefully balanced, the individual power meter for the unit was read, and a standard dynagraph card was taken. At the end of the test the final power reading was obtained and another dynagraph card was cut. Also, an electrodynagraph, a device that measures and records the instantaneous kilowatt-hour requirements of the motor throughout the pumping cycle, was used to obtain a power curve. Production tests through a test treater were made during the last 4 days of the test period.

The electric motor driving the unit was transferred to the Mark II and the second phase of the test got under way.

The Mark II was put in position over the well, was counterbalanced,

and put in service. This unit was also an API 114 unit, and was operated on test for 185 hours.

The initial power reading was recorded, a standard dynagraph card was cut, and an electrodynagraph curve was obtained. At the conclusion of the test the final power reading was taken, a second dynagraph card was cut, and another power curve was obtained for confirmation. Continuous production tests were obtained during 4 days of the test period. The Mark II was then taken out of service, the conventional unit put back in operation, and another power curve was taken on the conventional unit for confirmation.

The well used during the tests was about 5,000 ft. deep, and was chosen for the tests because of its ability to produce a constant, relatively large amount of fluid.

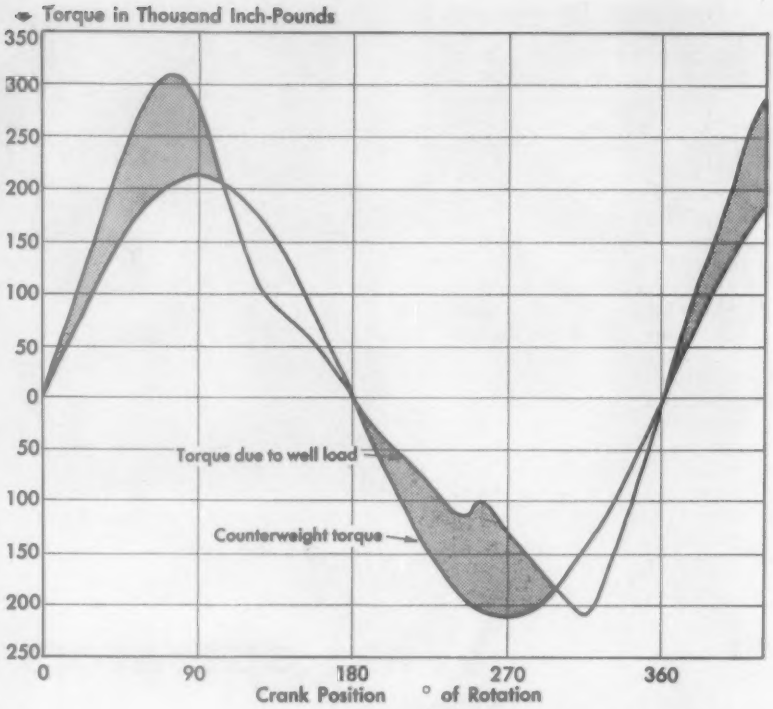
During the tests, both pumps were operated at the same speed of 16.5 s.p.m. The stroke length of the conventional unit was 55¼ in., and for the Mark II it was 54⅛ in. All downhole equipment was the same for both tests.

Test results are summarized in Tables 1, 2, and 3. The conventional unit consumed a total of 1,478 kw.-hr. of energy during the 207 hours of operation. Average production rate was 140.8 bbl. of fluid per day. Power consumption was 171.36 kw.-hr. per day. This gives a production ratio of 0.822 bbl. of fluid per kilowatt-hour of consumed energy. The peak polished-rod load was 11,500 lb. and the difference between the dynamic peak and the dynamic minimum of the instantaneous power input recorded by the electrodynagraph was 16 kw.

The Mark II unit consumed a total of 1,277 kw.-hr. of energy during 185 hours of operation. Average production rate was 145.3 bbl. fluid per day. Power consumption was 165.55 kw.-hr. per day. This gives a production ratio of 0.877 bbl. fluid per kilowatt-hour of consumed energy. The peak polished-rod load was 10,400 lb., and the differential between the dynamic peak and the dynamic minimum of the instantaneous power input recorded by the electrodynagraph was 2 kw.

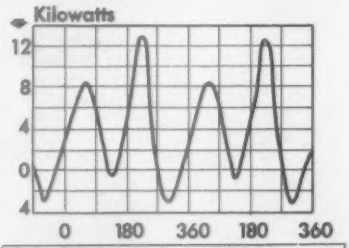
What the results show. Comparison of power consumption of both units using the same prime mover shows a 3.4% reduction in favor of the Mark II. On a per barrel basis the Mark II shows an advantage of 6.3%. The Mark II produced an additional 4.5 bbl. of fluid per day, an increase of 3.2%, with a pumping stroke 1⅛ in. shorter than that of the conventional unit.

Producing-company engineers eval-

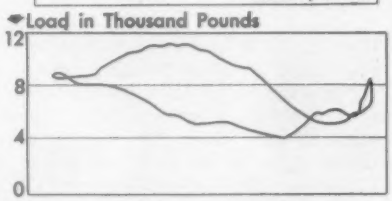


Torque Factors

Crank Position		For Well Load	For Counterw.
1	0°	0.00	0.0
2		− 9.11	+ 6.95
3		−16.50	+13.48
4		−22.15	+19.05
5		−25.15	+23.35
6		−27.20	+26.05
7	90°	−26.97	+26.95
8		−24.70	+26.05
9		−21.00	+23.35
10		−16.12	+19.05
11		−10.68	+13.48
12		− 5.24	+ 6.95
13	180°	0.00	0.00
14		+ 4.82	− 8.95
15		+ 9.20	−13.48
16		+13.40	−19.05
17		+17.80	−23.35
18		+21.90	−26.05
19	270°	+25.80	−26.95
20		+28.50	−26.05
21		+28.90	−23.35
22		+25.80	−19.05
23		+19.15	−19.48
24		−10.01	0.00



Peak polished-rod load	11,500 Lb.
Minimum polished-rod load	4,400 Lb.
Range	7,100 Lb.
Production 4-day average	140.8 B/D
Strokes per minute	16.5
Stroke length	55¼ In.
Electrical energy	1,713 Kw.-Hr./Day
	0.822 B./Kw.-Hr.



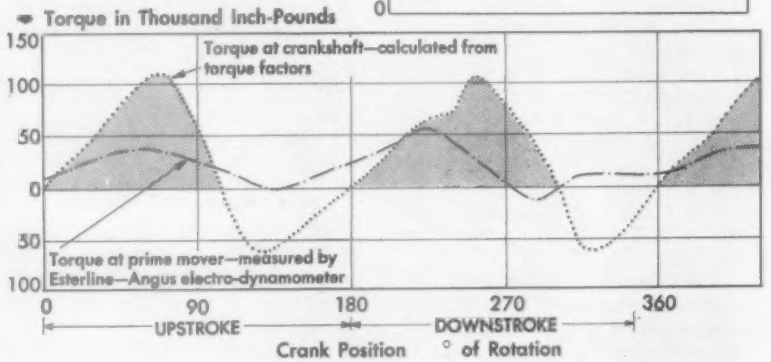


FIG. 2.

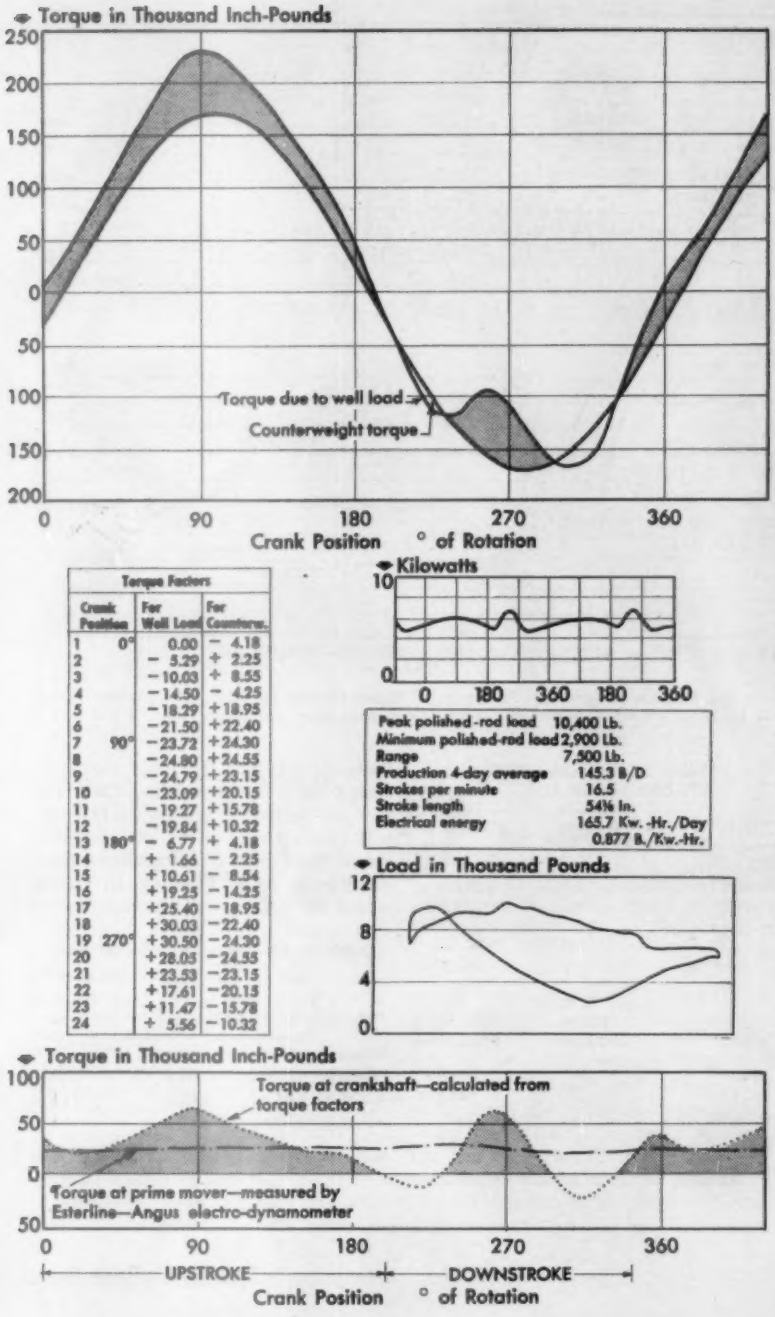


FIG. 3.

POWER STUDY for conventional 54-114 pumping unit, Fig. 2, and for Mark II 54-114 unit, Fig. 3. Upper curve was plotted by multiplying the rod load (ond counterweight load) from the dynamometer card by the torque factor for each 15° crank travel interval. Shaded area represents the energy supplied by the prime mover. Lower curve shows the torque at the prime mover as measured by an electrodynamometer, and the torque supplied by the prime mover (shaded area transferred from upper curve). Also shown in the figure are the dynamometer card and a portion of the wattmeter chart, the table of torque factors, and operating data for the unit.

uating the performance of the Mark II reasoned that the increase in production rate was due to the different pumping motion of the unit. It has a faster downstroke than upstroke, and it was felt that this could be responsible for increased plunger travel.

The peak polished-rod stroke on the Mark II was 9.6% less than the load on the conventional unit.

The difference between the instantaneous maximums and minimums shows that the Mark II introduced energy into the pumping system more uniformly than did the conventional machine.

Torque. Power studies were made on the two units. The same procedure was used in both cases, and the results are shown in Figs. 2 and 3.

The dynamometer card was divided into increments of 15° of crank travel. The rod load for each station was measured on the card, and was multiplied by the torque factor for the same point. The product obtained is the torque at the main shaft at that station. These torque values were then plotted for one cycle of rotation.

The counterbalance torque curve was found in the same manner, and was plotted on the same axis. The shaded area between the two torque curves represents the energy supplied by the prime mover; the nonshaded area represents the time when the pumping unit was back-driving the motor and putting electrical energy back into the power-transmission system.

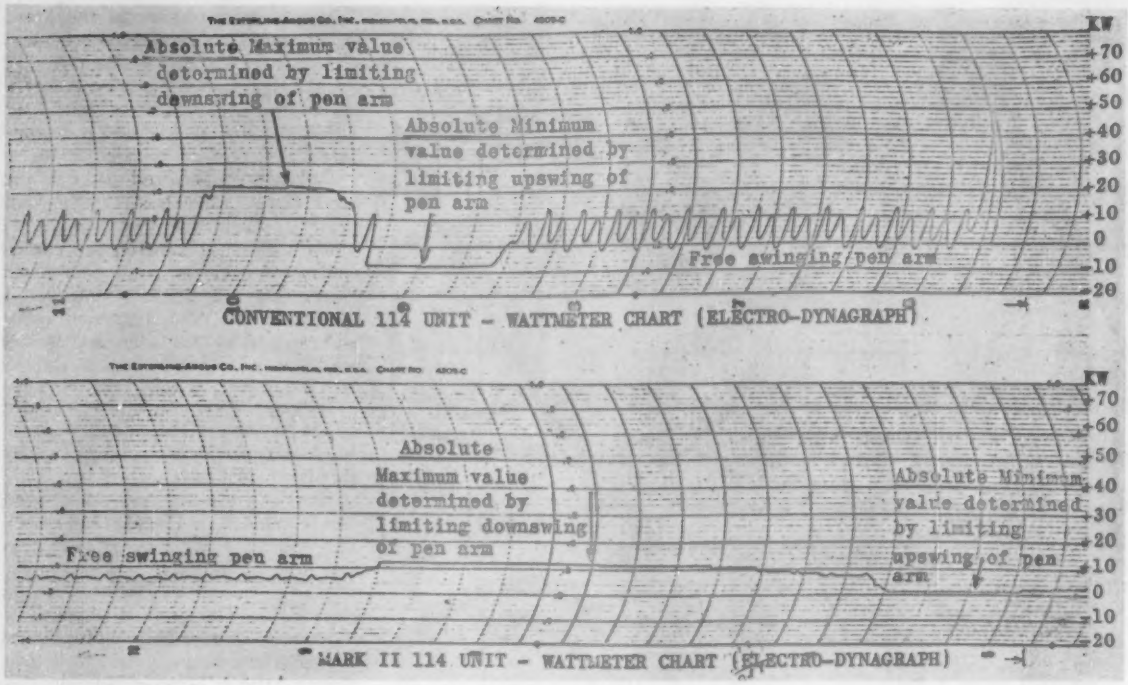
The lower curves in Figs. 2 and 3 show the torque measured at the prime mover. The power curve from the electrodynagraph was divided into the same 15° increments and the power reading at each point was converted into torque. These torque values were then plotted as the lower curve in Figs. 1 and 2. Superimposed on this curve is the torque supplied by the prime mover (the shaded portion of the upper curve).

It is apparent from the lower curves that the torque of the Mark II unit is more uniform than that in the conventional unit. Also, peak torque for the Mark II unit was only 65,000 in.-lb. compared with 110,000 in.-lb. for the conventional unit. This represents a reduction of 40.9% in favor of the Mark II unit.

Also shown in Figs. 2 and 3 are portions of the wattmeter charts and the dynamometer cards that were taken during the test runs. Originals of these are shown in Fig. 4.

Company "B" Report

Data made available to the Journal by the second company testing the Mark II and a Brand X unit are less



ACTUAL PHOTOGRAPH of the strip chart from the electrodynagraph. Portions of these charts for the conventional unit, above, and Mark II, below, are reproduced in Figs. 2 and 3, with curves of other operating variables. Fig. 4.

complete than those already given. Only tabulated data and some curves were released.

Not much is known about the conditions under which the tests were run. It is known that the same well was used in all production tests, and the downhole equipment was not changed. But it is not known whether the same motor was used on both units, or whether the units were operated on a 24-hour basis. Data are reported as barrels per 24 hours, kilowatt-hours per 24 hours, etc., but this could have been extrapolated from short-term tests. Nothing is known about the accuracy of the instruments

Table 1—Power-Consumption Figures

Conventional Unit

Date	Hours Pumped	Meter Reading, Kw.-hr.
10-12-59	9.5	56,892
10-13-59	22.0	.....
10-14-59	24.0	.....
10-15-59	23.5	.....
10-16-59	23.0	.....
10-17-59	24.0	.....
10-18-59	24.0	.....
10-19-59	24.0	.....
10-20-59	24.0	.....
10-21-59	9.0	58,370
Totals	207.0	1,478

Mark II Unit

Date	Hours Pumped	Meter Reading, Kw.-hr.
10-21-59	8.0	58,382
10-22-59	24.0	.....
10-23-59	24.0	.....
10-24-59	24.0	.....
10-25-59	24.0	.....
10-26-59	24.0	.....
10-27-59	24.0	.....
10-28-59	24.0	.....
10-29-59	9.0	59,659
Totals	185.0	1,277

Table 2—Production Tests

Conventional Unit

Date	Hours Pumped	Total Fluid, B/D
10-17-59	24	139.7
10-18-59	24	142.6
10-19-59	24	140.5
10-20-59	24	140.4
Average		140.8

Mark II Unit

Date	Hours Pumped	Total Fluid, B/D
10-22-59	24	144.8
10-23-59	24	145.8
10-24-59	24	144.9
10-25-59	24	145.5
Average		145.3

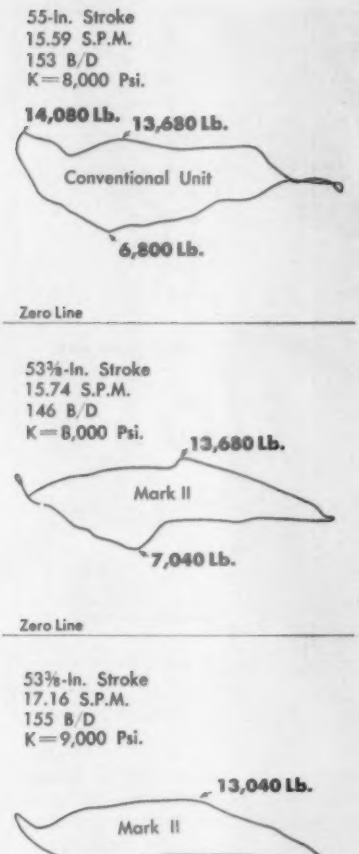
Table 3—Electrodynamometer Readings

Reading	Conventional Unit	Mark II Unit
Dynamic peak	+13 kw.	+ 7 kw.
Dynamic minimum	− 3 kw.	+ 5 kw.
Absolute peak	+21 kw.	+12 kw.
Absolute minimum	− 7 kw.	+ 1 kw.
	Δ D=16 kw.	ΔD= 2 kw.
	Δ AB=28 kw.	Δ AB=11 kw.

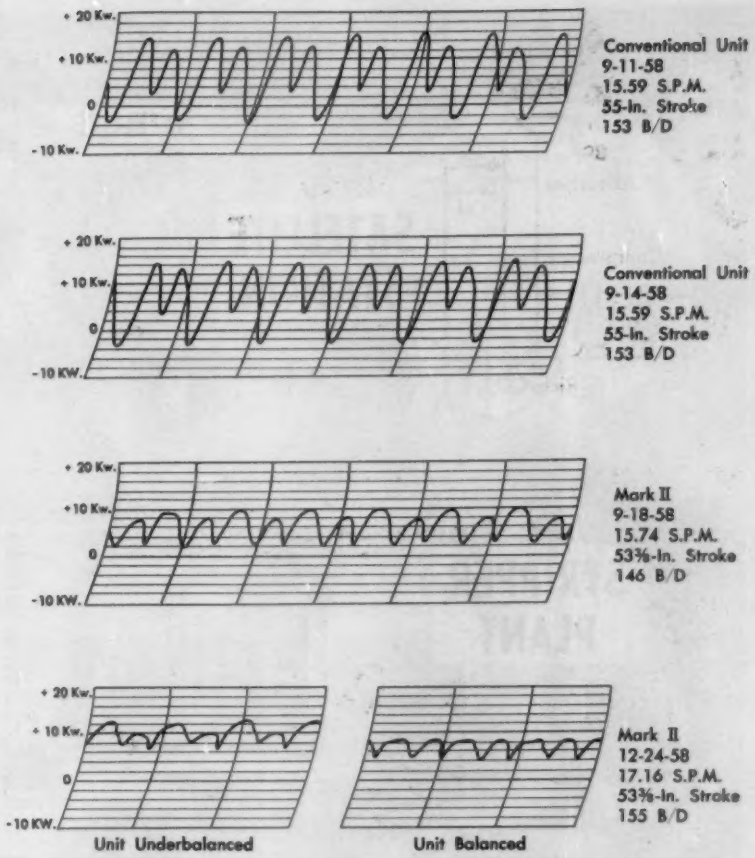
Table 4—Test Data OEC

Test No.	Date (1958)	Pumping unit	Stroke length (in.)	S.p.m.	24-Hour production: Oil (bbl.)	Water	GOR, cu. ft. /bbl.	Tbg. PR (psi.)	Csg. PR (psi.)	Fluid* Level Ft.
1	9/10	Conv.	55.0	15.59	153.1	0	200	90	90	4150
2	9/12	OEC	53⅜	15.74	137.3	0	200	90	90	4200
3	9/13	Conv.	55.0	15.59	152.7	0	200	90	90	4175
4	9/18	OEC	53⅜	15.74	146.1	0	200	90	90	4175
5	9/19	OEC	53⅜	15.74	146.0	0	200	90	90	4125
6	12/2, 3, 4	OEC	53⅜	15.74	146.4	0	200	70	70	.....
7	12/8, 9, 10	Conv.	55.0	15.59	157.1	0	200	70	70	.....
8	12/21, 22, 23	OEC	53⅜	17.16	155.4	0	200	75	75	4300

*Fluid level obtained with a Sonolog instrument. †After balancing the unit, the rms current Sucker rods, 850 ft.—⅞ in., 4,900 ft.—¾ in. = 5,750 ft. Pump plunger, 1½ in. Tubing, 2⅜ i



DYNAMOMETER CARDS for the conventional unit, at top, and the Mark II unit supplied by Company B. The operating characteristics were not identical with regard to stroke length, strokes per minute, etc., but these data are shown so that individual evaluations may be made. Fig. 5.



WATTMETER CHARTS from the Company B tests. While the information made available to the Journal doesn't mention it, it can be assumed, from the operating data, that these charts were taken at the same time as the dynamometer cards shown in Fig. 5. No reason was given for including the chart taken before the unit was balanced. Fig. 6.

used, or the frequency at which data were recorded.

Table 1 summarizes the data and some of the results of the tests. It shows that some of the tests were of short duration, and others covered a period of 3 days. The stroke length for the Mark II unit was 53⅜ in., 1⅝ in. shorter than that of the other unit, while the pumping speed was about the same. This could account for some of the difference noted in the oil-production column, where the Mark II shows up at about 4% less than the other unit.

Volumetric efficiency of the Mark II appears less than that of the other unit in all tests. The dynamometer cards for the Mark II in Fig. 5 show very smooth operation, with probably no overtravel.

Average root-mean-square current for the Mark II unit was consistently about 23% less than that consumed by the other unit. Peak current was generally less on the upstroke, and a little higher on the downstroke. Total power consumption for 24 hours was less with the Mark II in most cases, but the other unit showed a slight advantage in the kilowatt hours per barrel column.

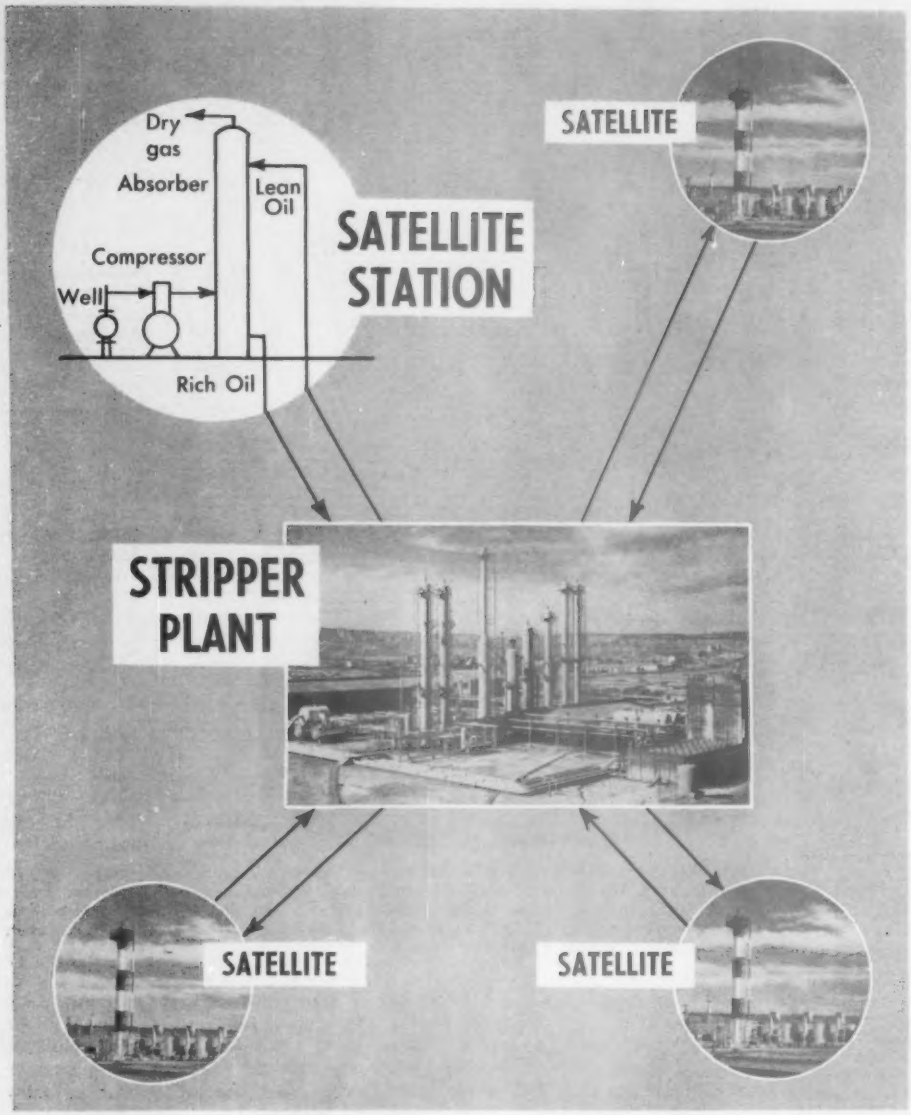
The recording wattmeter charts, Fig. 6, show a distinct advantage for the Mark II, in that the power is consumed at a more uniform rate. The peaks have been shaved off, and the upper and lower limits have been brought much closer together. This means that a smaller prime mover can be used for the same job.

No torque data were made available by Company "B" on these tests.

and Conventional Pumping Units

Vol. Eff. %	Avg. RMS Current	Peak-Current Up-Stroke	Peak-Current Down-Stroke	Kw.-Hr. (24 hrs.)	Kw.-Hr./B	Recording Wattmeter High Peaks (kw.)		Recording Wattmeter Low Peaks (kw.)		Rge. (kw.)
68.08	22.0	31	25	204.3	1.334	16	13	−2	4	18
62.33	17.0	24	27	188.7	1.374	9.5	7	3.5	2	7.5
67.90	22.5	32	26	204.7	1.341	15	14	−3	4	18
66.32	17.5	24	28	188.9	1.293	10	8	2	2.5	8
66.28	17.0	24	28	188.6	1.292	10	7.5	2	2	8
66.46	17.7	23	31	202.2	1.382	...	...	....	...	...
69.86	21.8	30	30	222.9	1.419	...	...	....	...	...
64.70	†19.8	30	27	224.3	1.443	12	10	6	8	6

was reduced to 18.6 amp. Motor GE Model 5KG 1365GC2, hp. 20/13/7, 440 volts, 50° C. n. EUE.



HERE'S HOW the satellite system works. Lean oil absorbs the heavy ends from the wet-gas stream at remote absorbers. The rich oil goes to the central stripping plant where the natural gasoline is extracted. Lean oil returns to the satellite absorber.

Rangely flood moves ahead —Gasoline plant gains satellites

EVER SEE a gasoline plant with satellites? The California Co.'s got one!

No, there's nothing in orbit. It's just a new cost-cutting idea that works.

Rangely field, in northwestern Colorado, is showing off one of the latest ideas in gasoline-plant design. Departing from conventional plants, this one has absorbers at selected field locations, and the stripper at the central plant site.

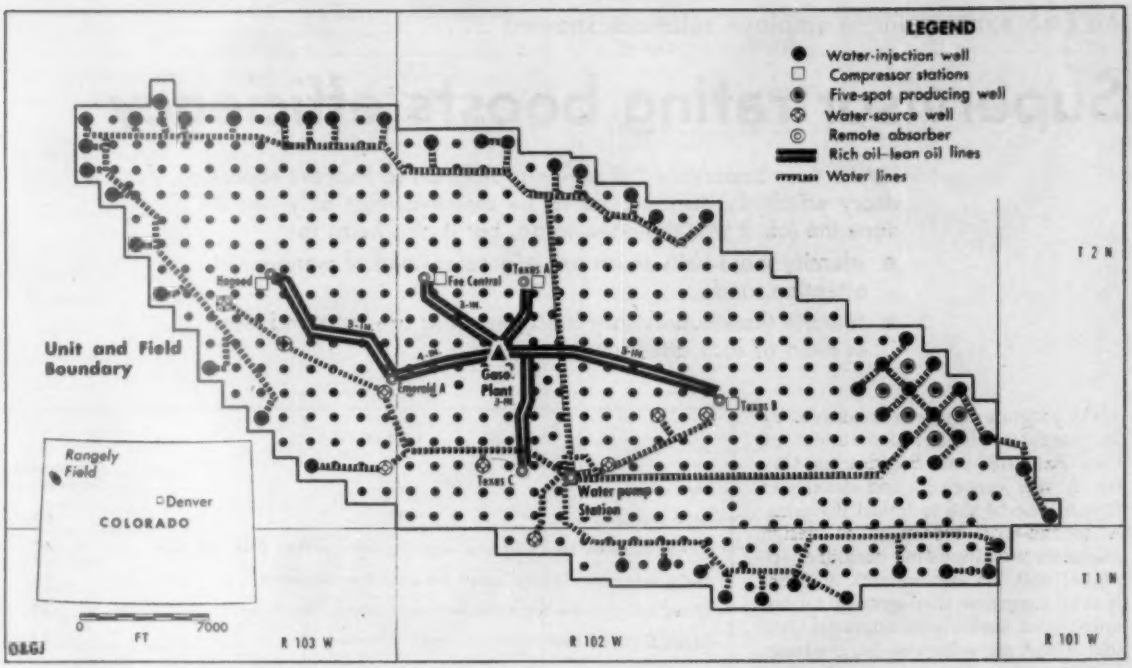
Calco engineers found that they could install absorbers at field compressor locations and pump the absorber oil back and forth to the plant cheaper than they could transfer the wet gas to the plant. This led to the satellite type of installation that is paying off.

BY W. B. BLEAKLEY
Production Editor

How it works. One of the features of the Rangely operation is the injection of gas into the crest of the structure, for pressure maintenance. This has been done by compressing casing-head gas at various convenient locations in the field.

From gas analysis, the field engineers found that this gas could be stripped of its heavy ends, at a profit. But getting the gas to the central plant location would cut into that profit.

The plant was originally designed so that it could be expanded to a total



LOCATION of the gasoline plant and the five satellite absorbers is shown here. Also shown is the water-injection system that now includes the wells on the southern flank of the structure.

capacity of 60,000 M.c.f. of wet gas daily. Additions and modifications are now being made to bring the plant up to maximum capacity. At the same time, supplemental facilities are being installed to extract propane, butane, and natural gasoline from a stream of rich oil which will be gathered from six remote absorbers.

These absorbers operate between the second and third stages of six scattered compression stations that have been used to inject gas into the Weber formation. This arrangement takes advantage of available horsepower at the six stations, and results in a minimum pressure drop. Calco engineers found that the total horsepower needed for this operation was less than would be required if the wet gas were sent to the centrally located plant.

Also, the system is more economical than the installation of commercial separation equipment at each of the six compressor locations.

Pipelines of 3 and 4-in. diameter are being laid on the surface to circulate the lean and rich oil between the remote absorbers and the plant. A total of 18 miles of line is needed.

Instrumentation is planned to alert the gasoline plant if any of the unattended satellites go off stream.

When in full operation, the remote absorbers will account for about 1,500 bbl. of propane, butane, and natural gasoline daily, in addition to the 2,000 bbl. now being extracted at the main plant.

Water-Injection System

Expansion of the peripheral water flood is going according to schedule (OGJ, Nov. 3, 1958, p. 50 and Dec. 7, 1959, p. 93). A total of 55 wells has been converted to injection service. Eleven water-supply wells have been completed.

Latest addition to the system is the row of injection wells on the southern flank of the structure. (See map.) These nine wells have been converted from production to injection during the past year. Three water-supply wells have been completed in the same period.

Injection rate into the Weber formation is now about 85,000 bbl. daily. This amount will be gradually increased over the next few months to about 150,000 bbl. daily. Deep-well turbine and submersible pumps are to be installed in all of the supply wells. Pumping capacity at the central pump station is being increased to handle the additional water when it becomes available.

So far, about 22 million barrels of water has been used in the flood program.

Gas Injection

Wells at the crest of the structure are still taking gas as part of the improved recovery program that will eventually produce 50% of the 1.5 billion barrels of oil originally in place.

In all, 17 former oil producers are being used for gas injection, putting 90,000 M.c.f. per day back into the reservoir. So far, 220 billion cubic feet of gas has been returned to the producing formation.

Production Data

Rangely oil production is now running about 44,000 bbl. daily. Gas production is 125,000 M.c.f. per day; 90,000 M.c.f. of that amount is being injected, and the remainder is accounted for by plant shrinkage, lease use, and limited local sales. There is an unavoidable plant operational flare of about 2,000 M.c.f. per day.

Unit Operation

The Weber sandstone formation of Rangely field was unitized October 1, 1957, and includes 19,120 proven acres. Altogether there are 45 working-interest owners, and The California Co. was designated as unit operator. Some of the other major participants are: Union Pacific Railroad Co., Pan American Petroleum Corp., Phillips Petroleum Corp., Equity Oil Co., Texas National Petroleum Co., Texaco Inc., and Husky Oil Co.

The Rangely plant is under a different organization, but the major interest owners in the Rangely unit also participate in the plant operation. The California Co., with more than 50% undivided interest, is the plant operator also.

An Esso experiment in employe relations showed . . .

Supervisor rating boosts efficiency

"RATE Your Supervisor," a self-help program to improve supervisory efficiency, has proved to be effective. Not only has it done the job it was designed to do, but it also helps to:

- **Identify those units which are in greater need of managerial attention, and**
- **Identify those supervisory functions which are most and least in need of such attention.**

BY P. W. MALONEY AND P. J. PATINKA
Employe Relations
Esso Research & Engineering Co.

THIS program has been conducted by the employe-relations department of Esso Research and Engineering Co., but it was conceived and developed first in one of the technical divisions. A second-level supervisor of design engineers was discussing personnel appraisal with his section back in 1956. It was suggested that upward ratings might give supervisors appraisal data that would not otherwise be available. Furthermore, since several raters would contribute, it would be possible to protect subordinates' anonymity.

Form developed. The idea sounded intriguing so the supervisors worked with the nonsupervisors to develop a rating form. Dr. R. Winston Oberg of employe-relations department was called on for help and to run the program. An outsider, he could guarantee the anonymity which, it was believed, would be the key to really worth-while ratings.

The data went directly to Dr. Oberg. He prepared an individual report for each supervisor. The report told the supervisor both how he was rated and how the ratings on all supervisors averaged out. The latter provided a bench mark against which the supervisor could compare his own report.

Because "Rate Your Supervisor" (RYS) met with a favorable reaction in this one section, the experiment was reported to the rest of the company. Before long, the employe-relations department received requests for runs in other division.

Pilot run. In the pilot run there had been only 10 supervisors. Yet, the preparation of these 10 reports was exhaustingly tedious because of the number of calculations involved. It was therefore decided to computerize the reports.

Modifications were made so the systems group could write an IBM 650 program to handle computation and printout of the reports. Thereafter only those five items which called for an "essay" response required any clerical attention.

Computerization greatly facilitated report preparation. Between 1957 and 1959 it was conducted without too much difficulty in the nine principal technical divisions and in two staff divisions. Two hundred and seventy-five reports were prepared for supervisors at the first three levels. All ratings were by professional personnel.

Presented at ASME Petroleum Mechanical Engineering Conference, New Orleans.

Item	Pearsonian Correlation
Highest 10%	
Hard worker	.65
Makes his men feel they are working with, rather than for, him	.62
Keeps work from piling up on his desk for clearance	.62
Gives his men the technical help and advice they need	.49
Gives his men room for individual initiative	.44
Lets his men know when he thinks they have done a good job	.43
Doesn't know how to delegate	.42
Lowest 10%	
Is willing to sit down and help his men with technical problems	.06
Fair	.01
Keeps his men informed on matters affecting them and their work	.01
Stands up for his men, when necessary, to higher management	.01
Is able to sell his ideas to higher management	.00
Plans and organizes the work of his unit	−.04
Lacks backbone	−.04

SUPERVISORS were graded by superiors and by subordinates, and while all agreed on some traits (highest 10% shows points on which both levels agreed), there were radical differences on other points (lowest 10%), indicating that management may not know how well a supervisor is really doing in some categories. Fig. 1.

Program Mechanics

RYS was handled on a division-by-division basis (a technical division varies from 50 to 250 professional employes). In most divisions an oral presentation was made to the raters and to those who would be rated. In all cases a letter of explanation was sent to everybody involved in the program.

Elaborate measures were taken to guarantee the anonymity which seemed to be the sine qua non of such a program. An employe filling in a rating form did not identify himself, and he identified the person he was rating only by a serial number. Only one person had a copy of a given number-name list. This person was never in employe relations, and was, in most cases, a secretary in the technical division.

Completed rating forms were sent directly to employe relations. Because of the serial-number technique, even the people in employe relations did not know the supervisor to whom a

SUPERVISOR EVALUATION FORM
(For use by subordinates)

SERIAL NUMBER OF THE SUPERVISOR YOU ARE RATING ____ 1-5

HOW LONG HAVE YOU WORKED FOR HIM? ____ 6-10

DATE ____ 11-12

CHECK YOUR LEVEL
4 NON-SUPERVISORY
1 GROUP HEAD
2 SECTION HEAD
3 ASSISTANT DIRECTOR

A. CHECK LIST ON PERSONAL TRAITS

HOW WELL DOES EACH OF THE FOLLOWING WORDS OR PHRASES FIT THIS MAN?	FITS VERY WELL 1	FITS FAIRLY WELL 2	3	DOESN'T FIT VERY WELL 4	5	DOESN'T FIT AT ALL 6	
Good technical man	1	2	3	4	5	6	13
Tactful	1	2	3	4	5	6	14
Indecisive	1	2	3	4	5	6	15
Considerate	1	2	3	4	5	6	16
Unselfish	1	2	3	4	5	6	17
Good listener	1	2	3	4	5	6	18
Easy-going	1	2	3	4	5	6	19
Scared of higher authority	1	2	3	4	5	6	20
Apple polisher	1	2	3	4	5	6	21
Good at handling people	1	2	3	4	5	6	22
Inexperienced	1	2	3	4	5	6	23
Puts things off	1	2	3	4	5	6	24
Regular guy	1	2	3	4	5	6	25
Plays favorites	1	2	3	4	5	6	26
Has confidence in his men	1	2	3	4	5	6	27
Good technical background	1	2	3	4	5	6	28
Honest	1	2	3	4	5	6	29
Stubborn	1	2	3	4	5	6	30
Too conservative	1	2	3	4	5	6	31
Sets good example	1	2	3	4	5	6	32
Immature	1	2	3	4	5	6	33
Helpful	1	2	3	4	5	6	34
Fair	1	2	3	4	5	6	35
Receptive to new ideas	1	2	3	4	5	6	36
Jumps to conclusions	1	2	3	4	5	6	37
Hard worker	1	2	3	4	5	6	38
Treats people like numbers	1	2	3	4	5	6	39
Not forceful enough	1	2	3	4	5	6	40
Doesn't know how to delegate	1	2	3	4	5	6	41
Overemphasizes petty details	1	2	3	4	5	6	42
Has the respect of his men	1	2	3	4	5	6	43
Technically competent	1	2	3	4	5	6	44
Lacks backbone	1	2	3	4	5	6	45
Aggressive	1	2	3	4	5	6	46
Does most of the talking	1	2	3	4	5	6	47
When you ask him a question, he gives you or gets you an answer	1	2	3	4	5	6	48
Wants his men to get ahead	1	2	3	4	5	6	49

B. CHECK LIST ON RESULTS

HOW WOULD YOU RATE THE GROUP(S) "TOPS" THIS MAN SUPERVISES:	BETTER THAN MOST 1	2	ABOVE AVERAGE 3	AVERAGE 4	BELOW AVERAGE 5	
On "Esprit de corps" (team spirit)	1	2	3	4	5	50
On creativity	1	2	3	4	5	51
On importance of project assignment	1	2	3	4	5	52
On over-all performance	1	2	3	4	5	53

C. CHECK LIST ON JOB METHODS

HOW SATISFIED ARE YOU WITH THE WAY THIS MAN:	VERY DISSATISFIED 1	SOMEWHAT DISSATISFIED 2	REASONABLY SATISFIED 3	VERY SATISFIED 4	
Assigns work projects and outlines what he wants done	1	2	3	4	54
Gives you room for individual initiative	1	2	3	4	55
Considers your personal wishes in making assignments	1	2	3	4	56
Listens to your ideas and suggestions and uses them	1	2	3	4	57
Trains and helps you do your job better	1	2	3	4	58
Keeps up to date on what you are doing	1	2	3	4	59
Lets you know when he has criticisms of your work	1	2	3	4	60
Lets you know when he thinks you have done a good job	1	2	3	4	61
Explains his criticisms and the changes he suggests	1	2	3	4	62
Gives you the technical help and advice you need	1	2	3	4	63
Lets you make the decisions you should make	1	2	3	4	64
Sees that your abilities are fully used	1	2	3	4	65
Lets you know what you need to get ahead	1	2	3	4	66
Admits his own errors	1	2	3	4	67
Stimulates you to do good work	1	2	3	4	68
Keeps you informed on matters affecting you and your work	1	2	3	4	69
Plans and organizes the work of his unit	1	2	3	4	70
Stands up for you, when necessary, to higher management	1	2	3	4	71
Has authority to make the decisions you feel he should make	1	2	3	4	72
Makes you feel you are working with, rather than for, him	1	2	3	4	73
Is willing to sit down and help you with technical problems	1	2	3	4	74
Is able to sell his ideas to higher management	1	2	3	4	75
Is able to give you competent technical help	1	2	3	4	76
Makes prompt decisions affecting the output of his group	1	2	3	4	77
Keeps work from piling up on his desk for clearance	1	2	3	4	78
Sticks with his decisions once they're made	1	2	3	4	79

D. SUMMARY EVALUATION

1. Over-all, what kind of job would you say this man is doing? What do you think of the results he gets? The methods he uses?

2. Do you like working for him? Why? Or, why not?

3. In what respects is he a good supervisor?

4. What are his main shortcomings?

5. What do you think he can do about these shortcomings?

THESE WERE THE QUESTIONS answered by workers about their supervisors. Each supervisor so rated was given a tally sheet showing total results, and was also shown the average rating for all supervisors on his level in his own division, and the average rating for all supervisors on his level for all divisions. In this way, he could see in which areas his subordinates rated him lower than other subordinates rated their supervisors. Fig. 2.

1. Which of these statements best describe what you have done with the report you received?
   - 0% 1. Did not read it
   - 3% 2. Read it casually
   - 43% 3. Studied it carefully on receipt
   - 54% 4. Studied it on receipt and have referred to it since

2. Were any of the ratings or statements really unexpected?
   - 63% 1. Yes
   - 34% 2. No

3. If "yes," what kind of ratings/comments were surprising?
   - 7% 1. Mostly favorable ones
   - 22% 2. Mostly unfavorable ones
   - 34% 3. Approximately equal number of both

4. In general, do you think that the ratings were valid? Do you think the raters drew an honest picture as they see you?
   - 85% 1. Yes
   - 7% 2. No
   - 8% 3. Undecided

5. If "no," do you think the raters were . . .
   - 4% 1. Biased favorably
   - 5% 2. Biased unfavorably
   - 5% 3. Wrong in both directions

6. As a result of the report, did you make a conscious effort to continue operating in some manner endorsed by subordinates?
   - 82% 1. Yes
   - 18% 2. No

7. Did you make a deliberate decision to continue in some manner disapproved by subordinates?
   - 19% 1. Yes
   - 81% 2. No

8. Did you decide to change any methods disapproved by subordinates?
   - 81% 1. Yes
   - 12% 2. No

10. Did you discuss any part of your report with . . .
    Your supervisor?
    - 34% 1. Yes
    - 63% 2. No

    Your subordinates?
    - 37% 1. Yes
    - 61% 2. No

11. Each report costs the company $25-$50. Do you think you got that much development help out of it?
    - 71% 1. Yes
    - 10% 2. No
    - 18% 3. Undecided

12. Would you like to see the program repeated within a year or so?
    - 75% 1. Yes
    - 15% 2. No
    - 9% 3. Undecided

13. If yes, when?
    - 8% 1. 3-6 months from now
    - 16% 2. 6-12 months
    - 54% 3. 1 year or more

14. Over-all, how do you think the Rate Your Supervisor program has affected company productivity (short and/or long term)?
    - 0% 1. Strongly favorable
    - 62% 2. Favorably
    - 37% 3. Not at all
    - 0% 4. Negatively
    - 0% 5. Strongly negative

15. Over-all, how do you feel about the program?
    - 11% 1. Enthusiastic
    - 69% 2. Favorable
    - 16% 3. Neutral
    - 3% 4. Unfavorable
    - 0% 5. Strongly negative

TO SEE HOW THE RATING SYSTEM WAS WORKING, the above questionnaire was sent to 120 randomly selected supervisors. The 90 returns indicated that 70% of the supervisors reacted favorably to the idea, only 3% unfavorably, and none were strongly negative. These returns were anonymous, of course, so the answers and opinions would be frank and of value. Fig. 3.

given set of forms pertained. The completed report was sent back to the secretary in a sealed envelope with the serial number on the outside. Without opening the envelope, the secretary then supplied the name and forwarded it to the appropriate supervisor.

Meatiest area. Responses to the essay questions were paraphrased and peculiarities of speech were eliminated to make it difficult to identify a subordinate from the statement. This was the toughest problem in the administration of RYS. It soon became evident that these open-end comments were the meatiest part of the report, so one had to be careful neither to change meaning nor detract from intensity in the paraphrasing process.

Each of the 67 rating items has six possible answers (Fig. 2). The report which went to a supervisor showed the percentage of the raters who gave each of the possible responses. To give the supervisor bench marks, he was supplied with two additional percentage breakdowns on each item: The ratings given all supervisors at his level in his division, and the distribution of ratings on all supervisors at his level for all divisions.

No supervisor was given a report unless there were at least four raters. Partially because of this and partially because it seemed appropriate, second and third supervisors were rated by their immediate subordinates and also by employes two levels down.

Evaluation. Late in 1958 employe relations sought an evaluation of RYS from those who had participated. A total of 120 supervisors and 120 raters were randomly selected and sent questionnaires to complete and return anonymously to employe relations. Some 75% of the supervisors and 85% of the raters returned usable questionnaires.

The responses are shown in Figs. 3 and 4. The degree to which the program had been favorably received was heartening. It was even more encouraging to note that the reports apparently generated some behavioral change in the supervisors who were rated.

Since each supervisor acted on his own, unless he chose to consult with his bosses, it can only be hoped that the changes were for the better. At any rate, the time and effort which went into RYS seemed justified.

Other values. It seemed likely that the 2,000-plus rating forms might yield generalized data which would be helpful to management on supervisory development. This was complicated by the guarantees of anonymity. It necessitated circuitous routes to some of the studies and made others impossible. Since RYS was designed solely as a self-development tool, little attention was given to research possibilities when the program was structured. Within these limitations, the findings evolved from employe relations' search for byproduct data.

A Morale Measure

Comparisons of composite ratings between divisions revealed over-all, consistent differences in the way subordinates rated supervisors. Fig. 5 shows the kinds of differences which were seen throughout. It shows the ratings which second-level supervisors in three R & D units received on the

1. Did you see any short term change in the men you rated that you would attribute to the Rate Your Supervisor report?
   34% 1. Yes
   62% 2. No

2. Have you seen any lasting change you would attribute to the report?
   24% 1. Yes
   70% 2. No

3. Over-all, how do you think the Rate Your Supervisor program has affected company productivity (short or long term)?
   1% 1. Strongly favorable
   53% 2. Favorably
   43% 3. Not at all
   0% 4. Negatively
   0% 5. Strongly negative

4. Do you think that the people you rated really studied the reports?
   79% 1. Mostly yes
   7% 2. Mostly no
   8% 3. About half and half

5. Over-all, how do you feel about the program?
   7% 1. Enthusiastic
   62% 2. Favorable
   26% 3. Neutral
   3% 4. Unfavorable
   0% 5. Strongly negative

6. Did any of the supervisors you rated use the data in an unfair manner, as far as you know?
   2% 1. Yes
   95% 2. No

7. Are you convinced that your anonymity was protected?
   82% 1. Yes
   4% 2. No
   12% 3. Undecided

OPINION OF THE RATING PROGRAM as shown by 102 anonymous replies to 120 questionnaires sent to workers selected at random, showed 62% were in favor of the idea, only 3% unfavorable, and none strongly negative. It is interesting to note, however, that by almost 2-to-1 margin the workers could see no change in their supervisors as a result of the rating report. Fig. 4.

first five items relating to "job methods."

The differences are not large, but the fact that they are consistent was somewhat surprising. Within each of these divisions various individual supervisors received "good" or "bad" reports, and within any one report there were high and low areas. Still, the consistent variability shown in Fig. 5 and existent in most of the other items survived. It was concluded that these differences probably reflected over-all morale differences between the units. To the extent that high morale is a goal, this suggested that there might be a stronger need for management to review its methods of operation in some divisions than in others.

Area differences. It was hoped that an over-all analysis of the ratings would pin point managerial technique areas which were particularly in need of attention. The inadequacies of the data for research purposes made it difficult to evolve clear-cut conclusions. Nevertheless it indicated that, while the supervisors have technical competence, they could improve in certain leadership and communication skills, particularly with regard to job performance appraisal and personnel development.

Using 1,205 ratings, the 67 items were ranked in the order with which the supervisors received a favorable response. The items which fell in the top and bottom deciles of this "favorability ranking" are shown in Fig. 6. While the supervisors' fairness and technical ability were generally praised there was a cooler feeling towards leadership abilities.

Levels vary. "Second and third-level supervisors' reports reflected a composite of ratings by professionals at two levels. Because this grouping could introduce some contamination, a special comparative look was taken at these two levels of ratings in one division."

While second-level supervisors tended to be rated more highly by first-level supervisors than by the nonsupervisory professionals, the order tended to be reversed for third-level supervisors. Their immediate subordinates rate them slightly less favorably than did the first-level supervisors. The differences were consistent but were not large enough to conclude that individual personal reports were being severely contaminated by including two levels of raters.

The items with a large level difference, in the case of the second-level supervisors, were of a logical nature—the first-level supervisors were more satisfied than the nonsupervisors with their personal relationships with the second-level men. The level difference in the ratings given the third-level people seemed to reflect greater satisfaction farther down the line with the top man's leadership capabilities.

These differences (Figs. 7 and 8), are by no means clear cut.

Extremes rated. A "downward" rating form paralleling the regular RYS form was designed and used occasionally. There were 36 R & D first and second-level supervisors on whom both upward and downward forms were available.

The two sets of ratings were correlated for each of the 67 items. The mean of all RYS ratings was used as the "upward" rating. The items were then ranked in order of the magnitude of the correlation. Fig. 1 shows the items which fell in the highest and lowest deciles of this ranking.

The highest correlation is only 0.65, while in the lowest decile the correlations approximate 0.00. While the small sample precludes arriving at any strong conclusions, these data do seem to justify further research in this direction.

Supervisors and subordinates tend to agree on easily observable facets of the supervisor's job, but they have two nonrelated pictures of the supervisor in those areas which are harder to evaluate. If these low correlations persist in more extensive research one might wonder whether management has enough knowledge of how well the supervisor is doing his job.

Divisions vary. By working through

"Second and third-level supervisors' reports reflected a composite of ratings by professionals at two levels. Because this grouping could introduce some contamination, a special comparative look was taken at these two levels of ratings in one division."

R & D Division:	A	B	C
Assigns work projects and outlines what he wants done	3.00	3.08	3.27
Gives you room for individual initiative	3.34	3.31	3.82
Considers your personal wishes in making assignments	3.06	3.11	3.33
Listens to your ideas and suggestions and uses them	3.12	3.14	3.76
Trains and helps you do your job better	2.72	2.77	3.17

SOME DIVISIONS consistently rated their supervisors lower or higher than other divisions. For instance, looking at just the first five questions in the "job methods" section, workers in Division A rated all their supervisors lower than did the workers in Division C, and, with one exception, lower than workers in Division B. Division morale may be the answer here. Fig. 5.

Item	% of Favorable Response: By First Level Supervisors	By Non-Supervisors
When you ask him a question, he gives you or gets you an answer	96	78
Makes you feel you are working with, rather than for him	93	77
Keeps you informed on matters affecting you and your work	84	69
Listens to your ideas and suggestions and uses them	97	82
Considers your personal wishes in making assignments	95	83

SECOND-LEVEL SUPERVISORS were rated more highly on the same traits by first-level supervisors than by nonsupervisory professionals. This could reflect the closer personal relationships between first and second-level supervisors. Fig. 7.

Item	% of "Favorable" Responses
Highest 10%	
Honest	96.0
Hard worker	95.0
Good technical man	94.5
Good technical background	94.5
Technically competent	94.5
Fair	93.5
Mature	92.0
Lowest 10%	
Lets you know when he has criticisms of your work	71.0
Trains and helps you to do your job better	71.0
Easy-going	68.5
Stubborn	68.0
Scared of higher authority	67.0
Does most of the talking	66.5
Lets you know what you need to do to get ahead	52.0

OVER-ALL OPINION OF SUPERVISORS by workers showed that supervisors were considered fair, capable men as a rule, but when it came to their actual leadership abilities the workers downgraded them. Fig. 6.

Item	% of Favorable Response: By Second Level Supervisors	By First Level Supervisors
Good listener	76	96
Listens to your ideas and suggestions and uses them	77	97
Plans and organizes the work of his unit	79	97
Assigns work projects and outlines what he wants done	86	100
Unselfish	87	100
Sets good example	87	100
Does most of the talking	69	82
Stimulates you to do good work	79	91
Makes prompt decisions affecting the output of his group	83	94

THIRD-LEVEL SUPERVISORS were rated more highly by first-level supervisors than by second-level supervisors. Fig. 8.

the sole-holders of the lists it was possible to honor the anonymity and still make a comparison of RYS ratings and over-all managerial evaluation of the supervisors. Management put each of 98 first-level and 59 second-level supervisors in one of three categories—top 40%, middle 20%, and low 40%. Detailed comparisons had not been completed but one interesting type of difference had already become apparent; there are significant inter-divisional differences in superior-subordinate agreement on the supervisor's capability.

In one division the subordinates generally rated the top 40% supervisors more highly than the low 40%. The differences were consistent, and were statistically significant at the 10% level on 11 of the 69 items. In a second division the subordinates generally rated the top 40% supervisors lower than the low 40%, and the differences were statistically significant on 19 of the items. It seemed that subordinates in this latter unit, by and large, evidenced much lower over-all satisfaction with supervision than did subordinates in the first unit. It is possible that the discrepancy between what management values in supervision and the values held by subordinates contributes to an over-all lower degree of satisfaction with supervisors.

DELHI-TAYLOR OIL CORP. is firmly committed to the use of computers, and it has come a long way in a short time. Here's the story of . . .

How a computer is helping Delhi-Taylor

BY GEORGE HANSON
Delhi-Taylor Oil Corp.,
Corpus Christi, Tex.

SINCE WE FIRST began experimenting with gasoline-blending problems in 1957, programs have been developed for:

. . . Refinery accounting.

. . . Refinery earnings.

. . . Gasoline blending.

. . . Sales forecasting.

. . . Process engineering and design.

Production-department and various mathematical programs have also been developed.

The computer is installed at the Corpus Christi refinery. The basic unit is a Burroughs 205 with paper-tape input and output, automatic floating point, a tape-preparation unit, and two flexowriters.

The tape-input device is a photo-reader which reads information into the computer at a rate of 540 characters per second. The output device is a paper-tape punch which processes information at a rate of 60 characters per second, although an on-line flexowriter can also be used which has a printing rate of 10 characters per second. The most common mode of operation is to use the paper-tape punch with subsequent off-line flexowriter listing.

Personnel in the computer section consist of a chief computer engineer two programers, and a key-punch operator. The machine is in use an average of 6 to 8 hours per day.

Refining capacity at Corpus Christi is 35,000 to 40,000 bbl. per day. The company also operates a refinery at Port Isabel, Tex., which runs from 10,000 to 15,000 bbl. per day.

Processing units at Corpus Christi include two crude units, a TCC unit, two reformers, an aromatics-extraction unit, a visbreaker unit, light-ends processing units, and several special-purpose fractionating columns.

Here's an outline of our major computer programs; their purpose, data-input required, the calculations which the machine performs, and the results we get.

Refinery Accounting

Refinery accounting is handled by three main programs: daily tank inventory, stock-loss control, and a daily yield program.

Daily tank inventory. Purpose of this program is to give an up-to-date inventory of our tank-farm products.

Data fed to the machine includes tank gages, b.s. and w., temperatures, plus inventory from the preceding day. The gain or loss in net volume is calculated and the results reported in two forms. A gage sheet reports the volume in each tank and an inventory sheet shows the net volume on hand for each product.

The computer requires 10-12 minutes to perform this calculation and the information is reported each morning about 8:30 or 9:00 a.m.

Stock losses. These are reported every morning both by individual tanks and by product groupings. Data required to perform this calculation include figures on sales, receipts, and stock transferred plus results from the morning's tank-inventory program. About 10-15 minutes of computer time is required and the results are reported around 10:00 to 10:30 a.m.

Occasionally large losses are reported which are due to bad data and these must be laboriously tracked down. However, the system works well for the most part.

Daily yields. This program is in the experimental stage, but its purpose is to provide us with reliable process-unit production figures. There are several problems we must overcome, but we hope eventually to include weight balances too.

Adapted from a paper presented to WPRA, Casper, Wyo.

Meter readings and various data from the process units, results from the stock-loss program, and results from yesterday's operation are read into the machine. It calculates unit yields and losses on a volumetric basis and reports the results in two ways: the final report shows individual unit yields and product yields in both daily and cumulative figures. Calculation requires about 20 to 30 minutes per run.

Refinery Earnings Program

This program is a general-purpose refinery-simulation program which includes pertinent economic information such as raw-material costs, operating costs, and product prices.

It is used primarily for forecasting studies and for crude selection and evaluation. There are some optimization and iterative calculations about the reformer and crude units.

Generally, a case-study approach is used. Computer time per case ranges from 6 to 15 minutes.

Mathematical models have been developed for each operating unit. Some of these correlations are fairly simple while others are more complex. Detailed crude analyses are a very important part of the program. A pool treatment is used for the gasoline-blending section. Plans are under way for incorporating a linear program for this section. New and improved correlations are also being added as they are developed.

Output of this program consists of volumetric yields from the units, a gasoline-pool makeup sheet, and economic sheets indicating the various "incomes" and "expenses."

Gasoline Blending

This program is divided into three sections: A matrix-generator program, a linear program, and a digester program. These three programs remove much of the laborious hand calculations generally associated with the gasoline-blending problems. This package is regularly used for our refinery blending and for forecasting and long-range studies.

Blend specifications, component availabilities, and pertinent sales information are among the many pieces of input information to the matrix generator. This program punches a tape representing the inequality equations. The linear program optimizes these equations and produces a resulting answer tape which is input data for the digester program.

Final results include an over-all economic summary and a composition and inspection summary for each blend. Other results include "shadow price" and "cost-range" information for the proper variables.

Computer time ranges from 6 to 15 minutes for the first and last part of this package. Time required for solving the linear-program equations ranges from 30 minutes to 2 hours, depending on the size and complexity of the blending problem.

The program package is designed to handle five blends with a maximum of 60 restraints and a total of 110 variables (including the slack variables).

Forecasting Statements

One of these programs generates a preliminary profit-and-loss statement for the previous month's operation for each of the refineries. Another program is used for generating a forecasted profit-and-loss statement for both plants. Also, there is a program for the actual and forecasted inventory control and a profit-and-loss statement for our terminals. These programs require only a few minutes of computer time, but the calculations require several hours when done manually.

Engineering and Design

Light ends. This program is designed for simulating light-ends-processing flow sheets within the computer so that it can calculate heat and material balances at all stages of the process. Input data are a description of the process and the streams to the process. The output gives pertinent process variables including the quality of any or all intermediate and final process streams.

Flash calculations. There are two programs in this category.

The simple-flash program calculates the liquid-to-vapor ratio of any stream with constant temperature and pressure and will calculate the moles, pounds, and gallons of both vapor and liquid for each component. The program will calculate K values for any one or all of 20 different components commonly used in the refinery.

We have another flash program which was written by Burroughs Corp. and modified for our use. This program will calculate the liquid-vapor ratio at constant temperature and pressure; K values are loaded into the program. It will also calculate the flash temperature at constant liquid-vapor ratio and constant pressure.

Orifice design. This program calculates the required orifice diameter or coefficient to measure the flow of liquid or vapor in a given pipeline under given conditions. Computer time is about 10 seconds.

Crude-unit design. This program calculated a weight balance corrected to specified datum temperature, the flash curves, and the make and draw-plate temperatures for a specified crude unit. Input data are gas compositions; rate of flow, ASTM-distillation temperatures, and gravity of the crude and products; and top-tray pressure. Optional data include datum temperature, overflash, rate of stripping steam at each section, and liquid-reflux temperatures. Computer time is about 3 minutes.

Plate-to-plate calculations. This program was furnished by Burroughs. It is designed to calculate the separation of a multicomponent feed in a fractionating tower which has a given number of theoretical trays and specified reflux ratio and feed-tray location. Complete heat and material balances are also computed. A feed match method is used for convergence.

The program handles one feed stream which can have up to 20 components and products. There is no limit on the number of theoretical trays. Computer time is about 10 seconds per component per plate per iteration.

Heat exchangers. These programs are still in the experimental stage. When completed, they will be used for performance, rating, and design of liquid-liquid exchangers.

Line sizing. This program was received through AIChE's computer-program committee. It will size liquid, vapor, and water lines on the basis of a specified maximum pressure drop. It will also determine the pressure drop for a given diameter and length of pipe. Computer time is about 1 minute per six cases.

Tray dynamics. This program calculates various performance indexes and checks to see if a given tray configuration will adequately handle the prescribed vapor and liquid loads. The program will work for sieve trays and both round and long bubble caps. Computer time is less than 1 minute per case.

Other programs which we use are listed below. Some of these are ours; others were furnished by Burroughs Corp.

1. Various mathematical subroutines.
2. Multiple regression programs (fixed and floating point).
3. Regression data generators (fixed and floating point).
4. Equation solvers and matrix inverters (fixed and floating point).
5. Linear programs (fixed and floating point).
6. Distillation interpolation program.
7. Computer usage program.
8. TCC yield program.
9. Financial projections.
10. Ultraviolet analyses calculations.
11. Demonstration and housekeeping programs.

processes such as the Solutizer, Unisol and Mercapsol processes, and for such processes as vapor-phase clay treatment, or the redistillation of acid-treated cracked gasoline.

Finally, electrical precipitation is being more and more widely employed in connection with the settling operations of the acid-treating and caustic-washing processes. This adds $5 to $18 per daily barrel to the equipment cost of these processes, but the process is said to quickly pay for itself by greater capacity, cleaner products, and smaller consumption of chemicals.

The sum of all these installation costs on the basis of total amount of light oils handled, should be about:

	Bbl.	$/daily bbl. (1956)
Caustic washing	1	5-12
Sweetening	0.5‡	6-44
Finishing and blending	0.3	0.6-1
Additive injection	0.7	0.3-2
TEL addition	0.5	7.8-10
Probable extremes		25-60†
Sulfur reduction*	0.5	18-38
Probable extremes*		45-90†

*Using acid treating. Hydrogen treating is now widely used and this involves much higher installation costs but lower operating costs. †For the smallest plants (1,000 bbl. per day) to the largest (lowest cost). ‡Some cracked gasoline is sweetened with an inhibitor.

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Light-oil treating-2.

Plant costs and chemical prices

BY W. L. NELSON
Technical Editor and
Petroleum Consultant

PROCESS COSTIMATING No. 83 indicated the amounts of chemicals used in various light-oil-treating processes. Table 1 herein shows how the prices of chemicals have changed since 1947, and current prices of some of the chemicals are published each quarter (January, April, July, and October) on the Itemized Cost Indexes page of The Oil and Gas Journal.

Table 2 shows the approximate costs of treating equipment. Extremely simple equipment is used for additive or inhibitor injection, clay (sand or salt) filtration and some processes such as Nalfining. The most widely used processes are conducted in equipments that cost only $12-$60 per daily barrel—such processes as acid treatment, caustic washing, copper sweetening, and TEL blending.

More complicated plants are required for the regenerative types of

Instalments on Chemicals and Chemical Treatments

No. 43—Cost of Crude Oil Desalting, March 30, 1959, p. 167.
No. 49—Process Operating Costs—Caustic Washing, June 1, 1959, p. 180.
No. 58—Price Indexes of Refinery Chemicals, Oct. 12, 1959, p. 186.
No. 62—Chemicals Used in Various Processes, Dec. 7, 1959, p. 143.
No. 64—Indication of Chemical Consumption, Jan. 11, 1960, p. 97.
No. 68—TEL Consumed Since 1926, March 21, 1960, p. 127.
No. 70—Annual Consumption of Chemicals, April 25, 1960, p. 210.
No. 72—Chemicals Consumed in Refining, May 30, 1960, p. 109.
No. 74—Cost of Chemicals Outside U.S.A., June 27, 1960, p. 122.
No. 81—Gasoline Additives, Oct. 10, 1960, p. 248.
No. 83—Light Oil Treating—1, Nov. 14, 1960, p. 161.
No. 85—Light Oil Treating—2, this issue.
No. 87—Light Oil Treating—3, Dec. 26, 1960.

Many more issues pertaining light-oil and lube-oil treating will be published.

TABLE 2—APPROXIMATE INSTALLATION COSTS OF TREATING PLANTS

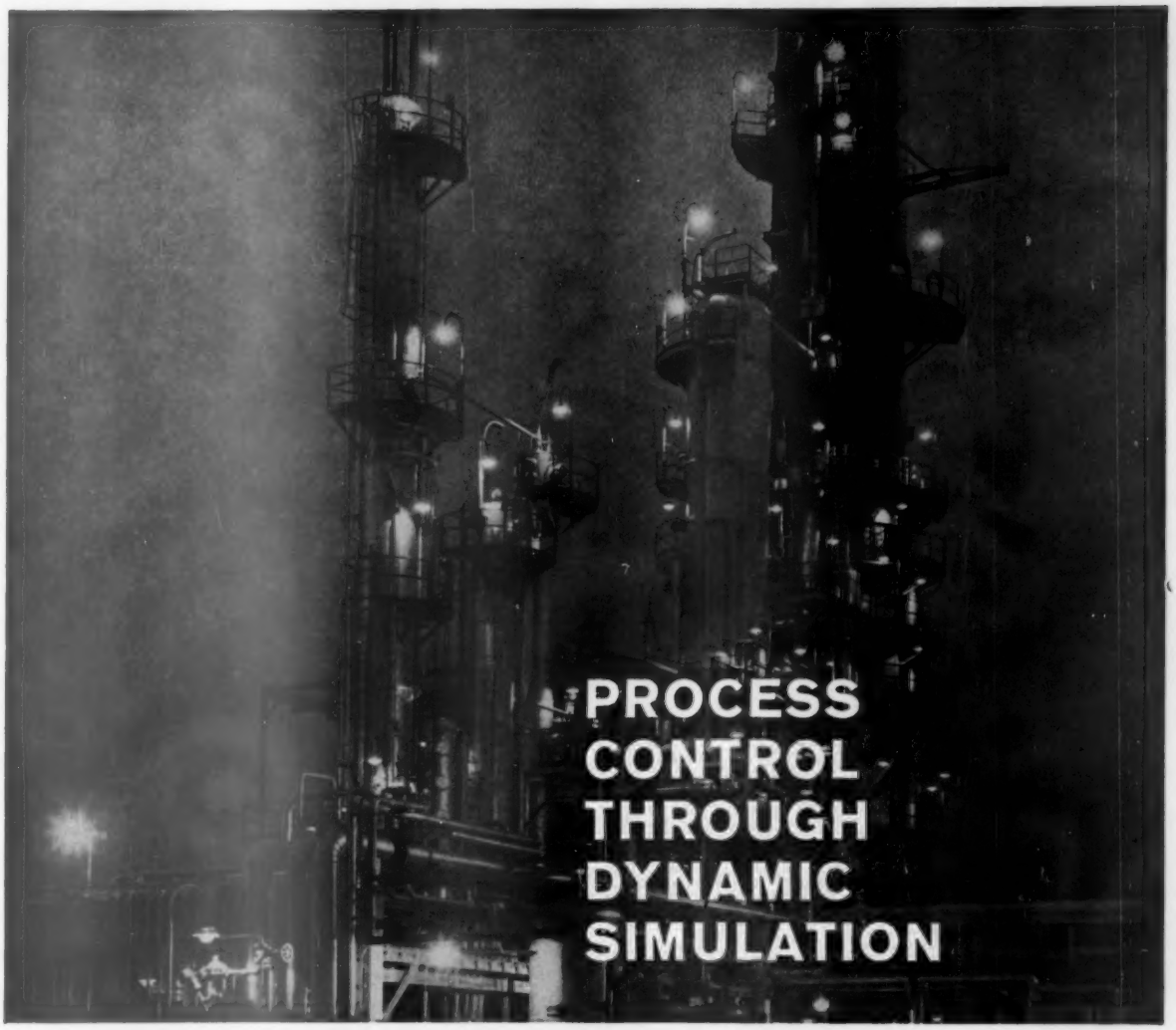
	Capacity	Dollars per daily bbl. 1946	1956	Reference*
Acid treating (continuous)	1,000-10,000	13-31	25-60	37
rerun distillation	1,000-10,000	20-65	39-127	38
Lead sulfide sweetening	1,000-10,000	7.6-15	15-29	9, 49
Caustic washing	2,000-20,000	4-10	8-20	34
Copper chloride sweetening	1,000-10,000	9.5-23	18.5-45	23, 37, 46
Doctor sweetening	1,000-10,000	7.6-19	14.5-37	39
Electrical precipitation	.....	2.3-9.4	4.5-18	42, 43
Filtration through clay, etc.	.....	1-2.2	2-4.1	..
Gray vapor phase	.....	19-32	37-63	37
Inhibitor or additive injection	2,000-15,000	0.25-1.50	0.49-3.0	37, 39
Nalfining	(Modification of existing plant)	0.22-0.33	0.44-0.66	11
Regenerative sweetening processes	.....	15-45	29-88	(†)
TEL blending	1,000-10,000	6-17.5	12-34	37
Complete treatment*	2,000-30,000	12-52	23-102	37

*Costs found in references were modified by computations. †Estimate.

TABLE 1—APPROXIMATE PRICES* AND PRICE INDEXES OF CHEMICALS USED IN TREATING LIGHT OILS

	1956 Price Bulk	1956 Price Use*	1947	1948	1949	1950	1951	1952	1953	1954	1955	1956	1957	1958	1959	1960 est.
Acetic anhydride	15c/lb.	19c/lb.	....	....	....	....	....	103.0	101.0	100.0	100.0	100.0	100.0	106.0	106.0	106
Acid, cresylyic, l.c.l. drums	73c/gal.	90c/gal.	....	....	....	....	....	100	100	100	100	100	100	100	100	100
Acid, muriatic	$30/ton	3c/lb.	67.0	65.5	66.5	77.5	104.0	90	96	100	100	100	100	100	100	100
Acid, sulfuric	1.12c/lb.	1.5c/lb.	73.6	69.5	76.1	80.8	89.5	89.5	95.5	100	100	100	100	100	100	100
Caustic soda	2.6c/lb.	4c/lb.	62.7	71.0	73.5	76.3	80.6	80.6	84.8	90.9	94.3	100	103.6	112.6	115.7	115.7
Copper chloride, tech. crystals	30.75c/lb.	40c/lb.	....	57	....	....	....	....	89.3	89.3	102	100	92.5	89.3	126.8	127.7
Copper sulfate	17.5c/lb.	20c/lb.	57	62.5	58.5	63.5	72	72	82	83.2	103	100	93	93.5	188	104
Diatomaceous earth, c.l., bags	$65/ton	5c/lb.	....	....	....	....	....	....	100	100	100	100	100	100	100	100
Litharge, l.c.l.	18c/lb.	24c/lb.	....	....	....	....	....	....	84.5	87.5	91.5	100	93	71	82	77.8
Methanol	31c/gal.	38c/gal.	77.5	83.5	82.5	84.5	103	103	103	93.5	95	100	105	84	97	97
Oxygen	–c/ft.³	0.8c/ft.³	....	....	....	....	....	98	97.5	97.5	97.5	100	102.5	106	106	106
p-Phenylene diamine, l.c.l.	$1.30/lb.	1.40/lb.	....	....	....	....	....	....	92.5	92.5	104	100	100	108	108	119.1
Pot. hydroxide, 90%, drums	8.7c/lb.	10c/lb.	....	....	....	....	....	....	100	100	100	100	103	104	100	103
Rock salt	1c/lb.	1.3c/lb.	48	95	95.5	100	107.5	77.5	82.5	97.5	96	100	104	108	108	108
Sulfur, sublimed	5c/lb.	6c/lb.	91.5	103	103	108	120	83	93	100	100	100	100	88.5	88.5	88.5
Inorganic average	.....	.....	....	73.7	....	....	....	88	92.2	96	97.2	100	101.8	103.1	103.9	104.7
Organic average	.....	.....	....	87.5	....	....	....	99	100	97.3	97.3	100	102.6	101.1	101.1	101.2

*Bulk prices at source or warehouse should be increased for the smaller quantities and for delivery, somewhat as indicated here.



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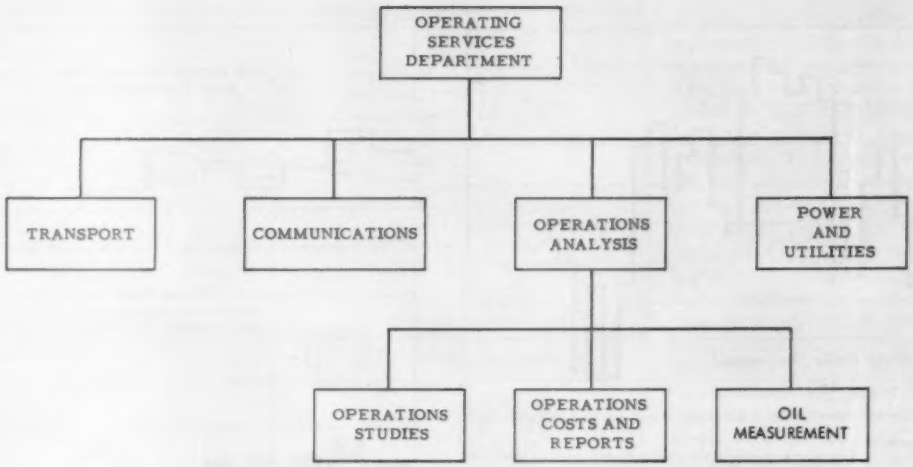


PRESENT REVISED ORGANIZATION of operating-services department. Fig. 1.

At Shell Pipe Line

Close check is kept on controllable costs by operating services department. Here's how this staff functions and how it deals with costs

BY ADIN H. HALL,
Supervisor, Operations Analysis Section
Operating-Services Department,
Shell Pipe Line Corp.

CONCERN for controllable costs is basic in performing most of the numerous functions of the operating-services department set up by Shell Pipe Line Corp. In year-to-year operation, controllable costs can be steered, while prorated costs are somewhat unyielding. Controllable cost data available in periodic summaries help explain cost variations. Power costs prepared with extensive use of computers are analyzed for determining the relation of power costs to line efficiency.

For analysis of both short and long-range operating problems, the corporation's operating-services department was organized to perform a specialized staff service. It is believed that the function of this staff differs from that of departments in other pipeline companies. Therefore, the staff's functions and how it deals with costs are discussed together in this article. The operating-services department is apart from the staffs dealing with supervision, engineering, and research for operating phases of the pipeline system.

Operating-services department, which reports to the manager operations, is organized as shown on the chart, Fig. 1. Functions and responsibilities of the department are as follows:

1. Making studies and recommending action to assure that adequate facilities are available, that they are being used properly, and advising ways to reduce costs to a minimum commensurate with other desired objectives.

2. Comparing, where possible, corporate operations with those of competitors and recommending action accordingly.

3. Studying division organization for best use of manpower, proper work-load balance, and proper alignment.

4. Negotiating with common-carrier communications organizations for leasing of communications circuits of an interoperating divisional nature and assisting in intradivisional agreements as needed.

5. Coordinating communications services among the operating divisions.

6. Negotiation and administration of utility agreements.

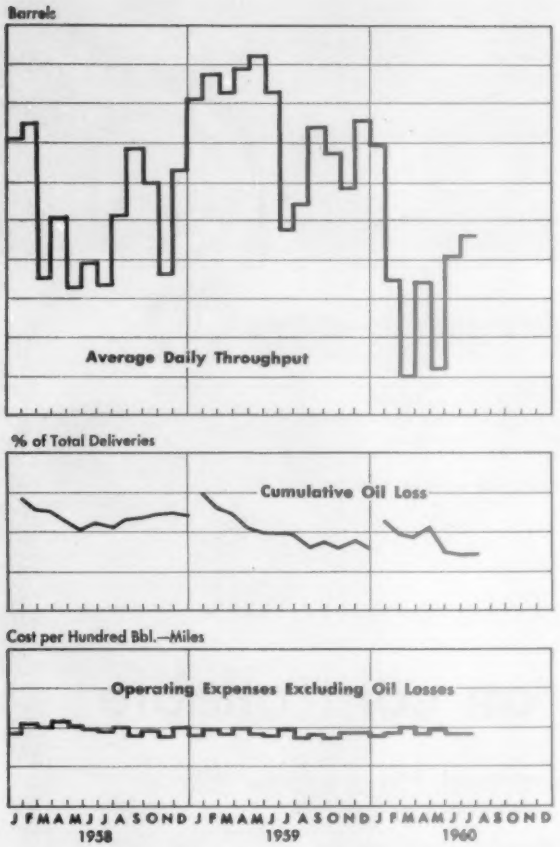
7. Establishing and functional administration of corporate automotive and aircraft policy.

8. Administration of oil-measurement policies and the maintaining of memberships on company and industry policy and standard-making committees.

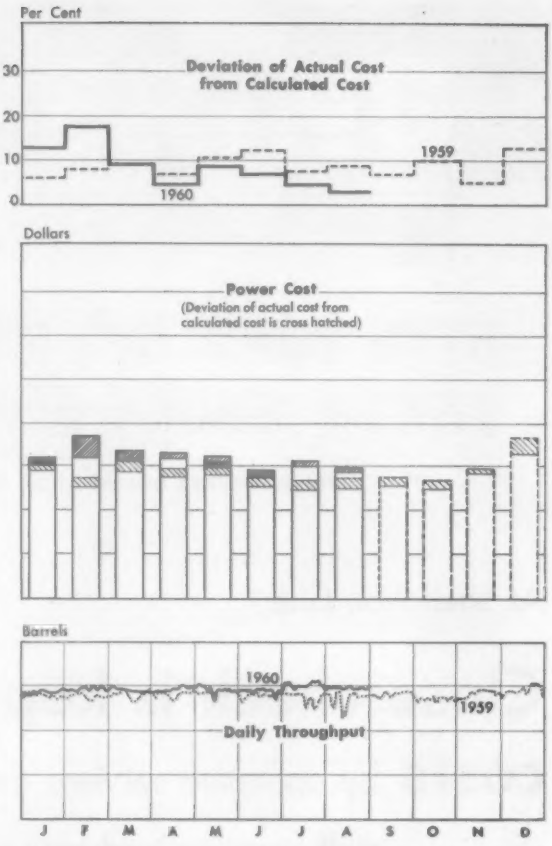
9. Long-range operations planning.

Functions of the department include elements of at least four categories of management: planning, organization, staffing, and control. Since operating services is a staff department, these functions are exercised through recommendations to line personnel. The department is staffed primarily with personnel who have specialized training in accounting and engineering, but they are expected to take a broad view and rely on other departments and the operating divisions for specialized assistance.

Cost data. Operating services leans heavily on the usual financial information supplied by the treasury organization. Last year, representatives from financial and operating-services departments developed a statistical


Barrels
Average Daily Throughput
% of Total Deliveries
Cumulative Oil Loss
Cost per Hundred Bbl.—Miles
Operating Expenses Excluding Oil Losses
J F M A M J J A S O N D J F M A M J J A S O N D J F M A M J J A S O N D
1958
1959
1960

TRUNK LINE operating cost variations. Fig. 2.



COMPARISON of power costs for an individual line. Fig. 3.

cost-of-operations statement which is prepared from accounting information and follows the scheme of responsibility accounting by locations. It emphasizes controllable costs and does not contain prorated costs.

Cost source. Another source of cost information used by operating services is an estimated cost of operations which is prepared annually. A format for this estimate has been in use for several years on stockholder-owned lines operated by Shell Pipe Line. This format, which closely follows the statistical cost of operations, is being extended to all operating division.

To prepare the estimated cost of operations, local personnel must review their manpower and facility needs for the coming year and predict the cost of the coming year's operation. Herein lies its primary value. The estimate is initiated by each location and reviewed by district, division, and head-office personnel before it is finally completed. The estimate then becomes a basis for investigating variations in actual operating costs.

This method is superior to a running average because the base is fixed and cost variations resulting from operating changes are anticipated.

Cost variation. It should be emphasized that operating services does not assume any of the financial or accounting functions. Emphasis is placed on the explanation and justification of cost variations because of operating needs. In this same vein, graphical data is prepared regularly which summarizes information from the financial statements. An example of summary data prepared for a trunk line is presented graphically in Fig. 2, above.

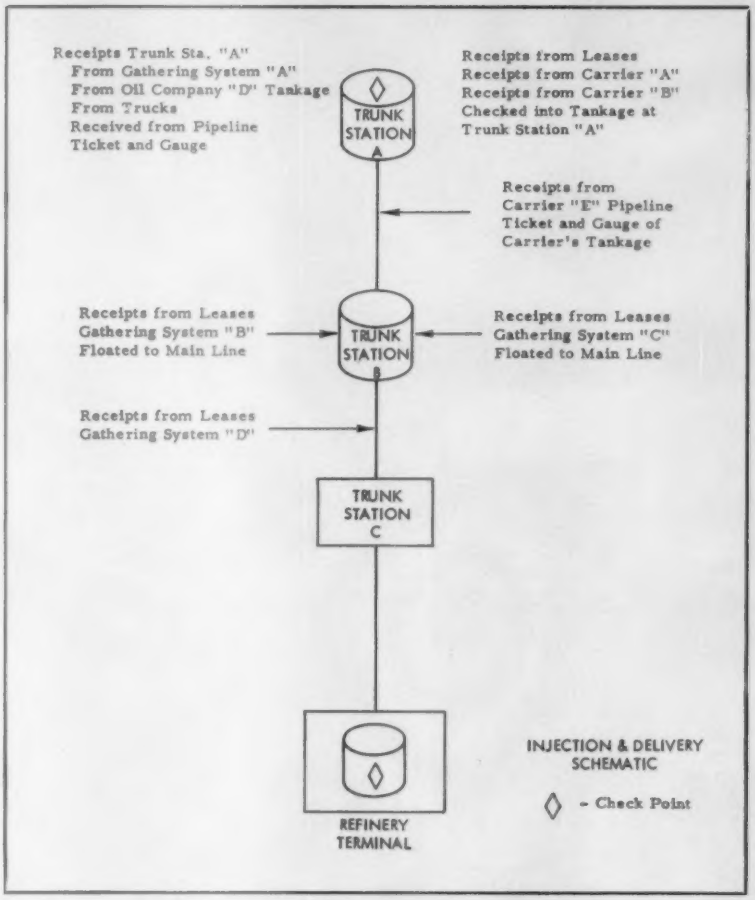
It may be noted that it contains financial and oil-accounting information, as well as line-operating data. In addition to these financial data, other information related to operations is used, such as personnel count, gaging activities, line-throughput forecasts, and oil-loss statements. Field surveys and on-the-ground inspections are made when necessary.

Reports. The operating divisions furnish a monthly report to the manager of operations which includes information concerning operations, construction, maintenance, personnel, and communications. These are summarized in operating services and distributed to appropriate personnel of lines operated by Shell. Operating services does not regularly receive detailed scheduling and dispatching information, but these are readily available as needed. A concerted effort has been made to minimize and combine the various reports so that there is no duplication of effort.

Power costs. Most of Shell's trunk lines are operated with electric-motor-driven pumps. Payments for electric power are, therefore, a major operating expense. All power bills are verified for payment in operating services, since expeditious handling is required to take advantage of discounts for prompt payment. Power costs for individual lines are assembled and the line efficiency evaluated.

This evaluation was formerly done with cost-throughput curves based on experience, but calculations for optimum power costs are now being made with the aid of a computer. Information concerning line optimization was published in The Oil and Gas Journal of May 2, 1960, under the title "Digital Simulation of Crude-Oil Pipelines." A calculated minimum cost is therefore obtained and compared with actual cost.

Reports reflecting this comparison for an individual line are issued in a



SCHEMATIC DIAGRAM of oil measurement. Fig. 4.

form as shown in Fig. 3. Extensive use is made of the computer for processing data shown on this graph. Good results from this analysis have been achieved since a 5% reduction in the differential between actual and calculated minimum costs for 1959 as compared to 1958 has been realized, although the total cost for power in 1959 was 12% greater than 1958.

Automotive costs. Operating services provides policy guidance for procedures to be followed in procuring and operating the corporation's automotive fleet. The policy brings together specialized information concerning application, purchasing, and insurance, as well as setting forth information for use and assignment of vehicles. To insure that transportation is provided at a reasonable cost and on a fair basis, cost data, assignments, and fleet-car usage are received at frequent intervals.

The communications function in operating services is concerned principally with interdivisional activities where administrative coordination of the use of facilities between divisions is required. Costs for operation of the facilities are carefully studied and investigations made where appropriate. Much of the negotiations with common-carrier communications organizations is the responsibility of operating services.

Long-range planning is becoming increasingly important in all business enterprise because of automation and the effect of taxes and increased operating costs. If an effort is made to predict operating changes over a period of a few years, many of the other factors in long-range planning can be established.

With operating services furnishing the primary effort, a long-range plan for automation of operations was formalized early this year. This plan is now being expanded to include in more detail all the facets of operations. Its completion will facilitate incorporation of operating changes and additions and the development of more accurate plans for staffing and training.

Oil measurement. All pipelines are aware of the importance of oil measurements. Oil must be received and delivered with an absolute minimum of losses. Shell has long followed the policy of tight-line operations and a minimum of measurement in tankage. This presents some measurement problems, but the resulting economics are most attractive since losses are minimized. In keeping with this policy, the installation of lease-automatic-custody-transfer facilities is actively encouraged and approximately 60 of these units are in operation throughout Shell-owned-and-operated systems.

As much as 80% of the oil gathered in some systems is measured by LACT facilities. Shell accepts the responsibility for the accuracy of oil measurement by performing calibrations at its expense and, in most cases, will perform maintenance of the facilities on an actual cost basis if the lease operator requests such service.

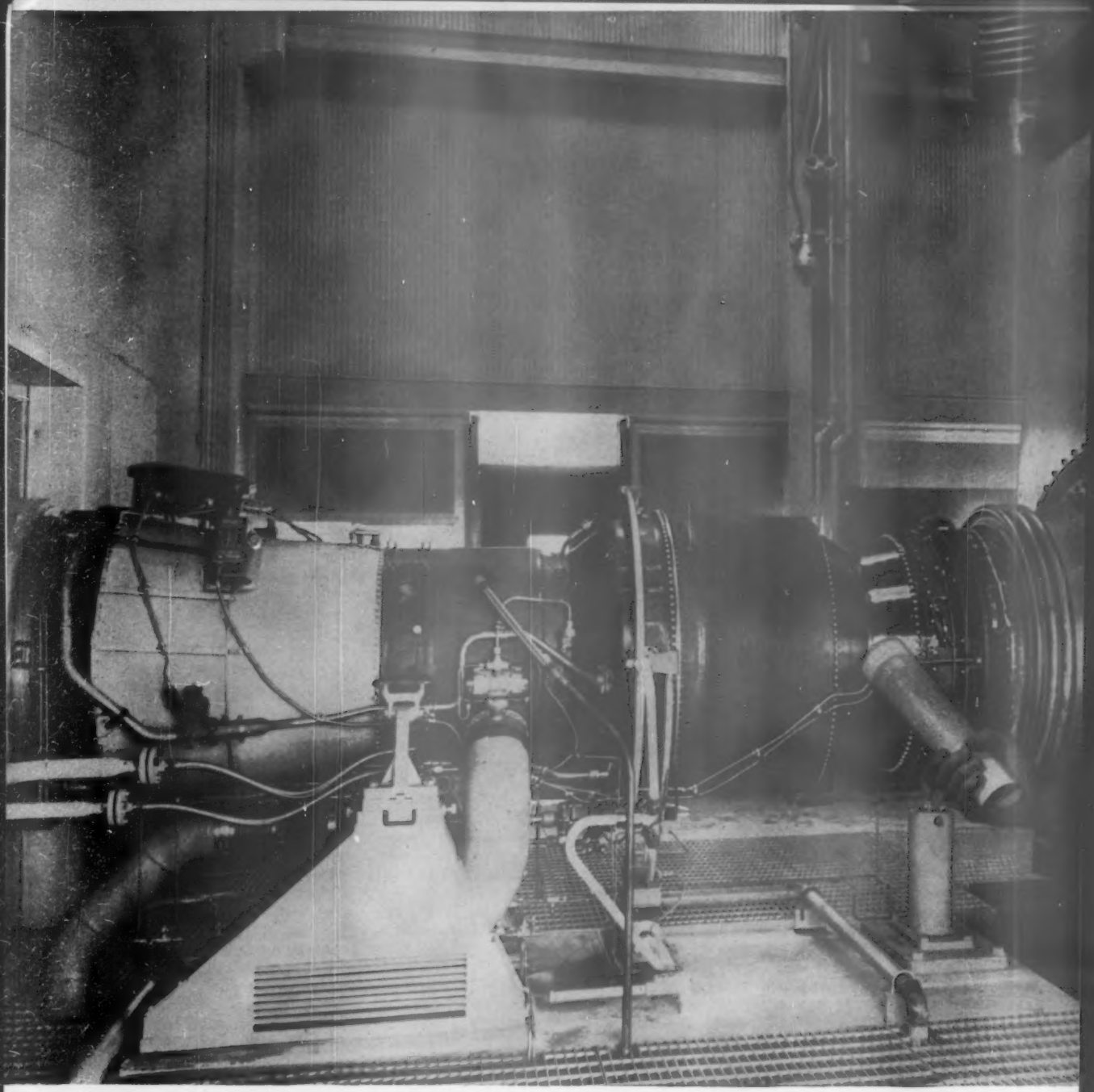
Shell believes that only through active participation on the part of the pipeline, as well as the lease operator, can the full benefits of LACT be realized. Administration of oil-measurement activities is based on Shell's gager's manual. Personnel in oil measurements are assigned to various company and industry committees to insure that the manual is current and consistent with the best practices. Oil losses are carefully analyzed and special studies are initiated when required.

To insure that oil-accounting loss-and-gain statements accurately reflect operations, oil-measurement schematics, as shown in Fig. 4, were developed. These are reviewed monthly and revised as necessary to provide reliable loss-and-gain information. These schematics were prepared with the cooperation of oil accounting and the operating divisions to establish a common basis for oil measurement for accounting.

Periodically, the operations of the corporation are evaluated in comparison with other major pipelines. An annual study is made of information reported to the Interstate Commerce Commission. Comparative studies can be made similar to that by The Oil and Gas Journal of July 23, 1959.

Informal surveys of other companies are sometimes used in studies of specific operations such as gaging or other activities. Although information available from others is limited as compared to our own company, every effort is made to properly evaluate the comparison, and conclusions drawn are considered worth while.

The major responsibilities of the department have been summarized, but many problems varying in nature and complexity are referred to the department for action or coordination. Each problem or request must be given the necessary time and effort.



R. L. Boyer, *Vice President and Director of Engineering, and* **W. B. Boyum,** *Manager of Gas Turbine Sales, The Cooper-Bessemer Corporation report . . .*

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Don't let fuzzy thinking foul up your rig hydraulic program

BY PRESTON L. MOORE
University of Oklahoma

WE COMMONLY HEAR the term "hydraulics" in the oil field today. There are several hydraulic manuals available for use. Everyone connected with drilling is, in general, familiar with jet bits. So, it might seem that a discussion of hydraulics could be no more than a rehash of an old technique.

In fact, however, jet bits and a carefully planned hydraulics program have not, for some reason, always been treated as related topics.

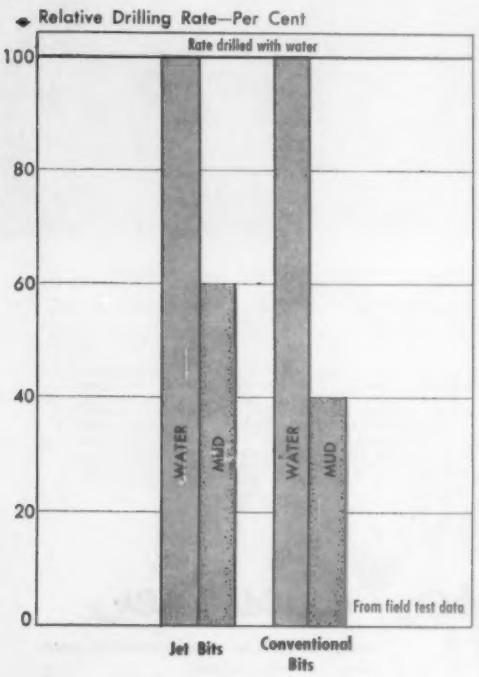
For example, jet bits are frequently used with nozzles of a size comparable to flow courses in conventional bits. Sometimes you see poorly designed hydraulic programs used as illustrations to show that there are no advantages to using jet bits. A standard excuse for not using jet bits is that the rig is not equipped with adequate pumps. Another is that the drilling rate is too low to require the cleaning action provided by jet bits. As a result even though jet bits were introduced in 1948 and even though they have saved the drilling industry hundreds of millions of dollars, they are not used in many areas and are used with poorly designed hydraulic programs in others.

Examples of poor practice. In the immediately previous article of this series, we stated that drilling rate is directly proportional to bit weight. While this is an accepted relationship, there are exceptions to the rule in all parts of the industry. Less than 5 years ago in the soft-rock areas of South Louisiana and the Gulf Coast of Texas, there were many drillers and operators that could show examples where drilling rate was no higher when bit weight was raised from 20,000 to 30,000 lb.

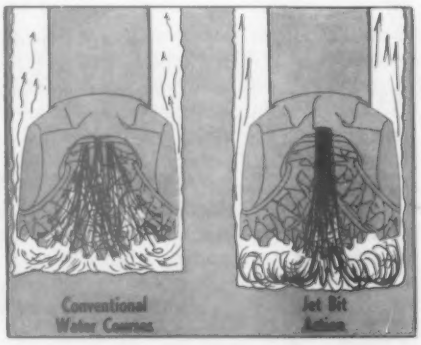
Today some of these people are still operating. Their results were correct, their beliefs sincere, and their desire to do a better job unequaled by any technical man. Unfortunately, they were in most cases associating this lack of improvement from increased bit weight with burying of the bit teeth. This is a true assumption only because the teeth were buried in free formation cuttings that had not been removed from bottom. With these conditions existing, additional bit weight in many cases did not improve drilling rates.

Even the use of jet bits only partially changed this initial thinking. Many operating personnel were convinced that pump pressures above 2,000 psi. could not be practical for extended periods of time. Such thinking limited the hydraulic program. reduced the effectiveness of jet bits, and made people question the justification for their use.

Who needs jets? Another conclusion published by many and accepted by a substantial portion of the industry is that use of jet bits can be based on drilling rate. The question is: Whose rate of drilling? Is it the operator in the hard-rock country using 40,000 lb. of bit weight, a mud weighing 11 lb. per gal. with a viscosity of 60 seconds. Or, is it the offset operator using 70,000 lb. and water.



EVEN WITH MUD in hard rocks, jet bits drill faster than do conventional bits. These tests were made by circulating alternate slugs of water and mud. Jet bits in mud retained greater portion of drilling rate with water than did conventional bits. Fig. 1.



DIFFERENT action of the mud flow through conventional and jet bits shows here. Jet bits direct mud stream to scour bottom of the hole. Conventional bit directs mud flow onto the cones in an attempt to keep them clean. Fig. 2.

The latter operator will be drilling about three times as fast as the first one. Based on this thinking, the latter operator might need jet bits, while the first operator would not. Actually the reverse is true. The fact is proved by the field tests shown in Fig. 1.

In this test, alternate slugs of water and mud were used as the circulating fluid. This alternation eliminated any effect due to hydrostatic pressure. Primary purpose was to show the difference in drilling rates using clear water and mud. The difference shows clearly; drilling rate with water was about two times that with mud.

Of equal importance were the results using jet bits. These were tests conducted in hard rock. Notice that the drilling rate with mud was 40% that of water using conventional bits, but was 60% using jet bits. Obviously, the jet bits reduced the detrimental effects of having mud in the hole.

The test was repeated for several days and all results were averages of a great number of runs. The results show the danger of using jet bits only at some given rate of drilling. Many times the formations are typed using this data and bit programs are predetermined by formation types.

Let me emphasize again that drilling rates are a function of many variables. Many of these, if changed individually, have less effect than if changed collectively with other practices.

To prevent regrinding. Drilling rate is fastest with a given set of conditions when cuttings are removed before regrinding can take place. This simple statement cannot be disputed. For review, look at a jet bit and a conventional bit, both shown in Fig. 2.

Water courses of the jet bit point directly at the bottom of the hole; the full force of the fluid hits bottom. Cuttings are actually blasted out from below the bit. The effectiveness of this action depends on the fluid power available at the point.

Now look at the conventional bit. The fluid power hits the bit teeth and bit cones. Cuttings are left to lounge unmolested below the bit. Certainly, some cuttings are removed because of turbulence at this point, but none of us, even those with the most vivid imagination, can believe that all cuttings can be removed before the next rotation of the bit.

Is the comparison logical? Yes, by most standards it is.

Pro and con. Then the question is: "Why are conventional bits used in preference to jet bits under any conditions?" There are two reasons: (1) Some believe that the fluid power should be directed on the bit teeth to prevent balling of the bit teeth; and (2) jet bits cost more than conventional bits.

First consider reason 1. If the hydraulic horsepower available at the surface is adequate and if the hydraulic program has been designed properly, then the turbulence produced around the bit will keep the bit teeth clean. This argument may not hold true 100% of the time because in some gum-type shale formations, shale particles may accumulate between cones of jet bits and lock them. Result is either pulling the bit or fishing for cones if it is not pulled.

This is a condition that occurs frequently. And when it does occur, it is for only short sections of the hole. Can the shale condition be solved? The routes open are: (1) use more hydraulic power at bit, (2) design a combination jet and regular type bit that prevents this from happening, and (3) keep faith in jet bits, but resort to regular bits in these intervals.

Certainly, it is of primary importance to use more fluid power through the bit. The added turbulence reduces this balling tendency. If enough power is available, balling can be completely prevented.

To design a bit for this purpose likely would not be justified since it would have only a limited market. However, the combination of two jet water courses and two smaller conventional water courses should prevent the balling between bit teeth. Such a solution might help because some operators may become discouraged on these occasions of balling and return to conventional bits completely. This, of course, will cost them money and will in many cases influence other segments of the industry against progress.

Is cost justified? Consider next the higher cost of jet bits. If drilling rates are not higher using jet bits, then the operator won't use this type of bit. However, it is already proved that the higher cost of jet bits is justified if all practices are being directed towards faster rates of penetration. This means the use of optimum bit weights and rotary speed, the use of a drilling-fluid program dedicated to reducing drilling cost, not merely the mud cost, and the availability of adequate pump horsepower for the well being drilled.

These things are important, not one at a time, but all at the same time. Therefore if the higher cost of jet bits is found to be not justified, it is charged that the operator in at least 90% of the cases is not using practices that permit a fair evaluation.

How much pump power? The first thing that must be considered in any hydraulic program is the amount of available hydraulic horsepower. This entails an investigation not only of pump size, but also of engine size. A 600-hp. slush pump cannot produce more than that provided by the prime mover. Also, an engine rated at 1,000 hp. long ago when it was new, may develop less than 500 hp. today. Thus, leaving nothing to chance is the best approach on the rocky road to improvement. Investigate the engine operation, determine the brake horsepower that can be developed today.

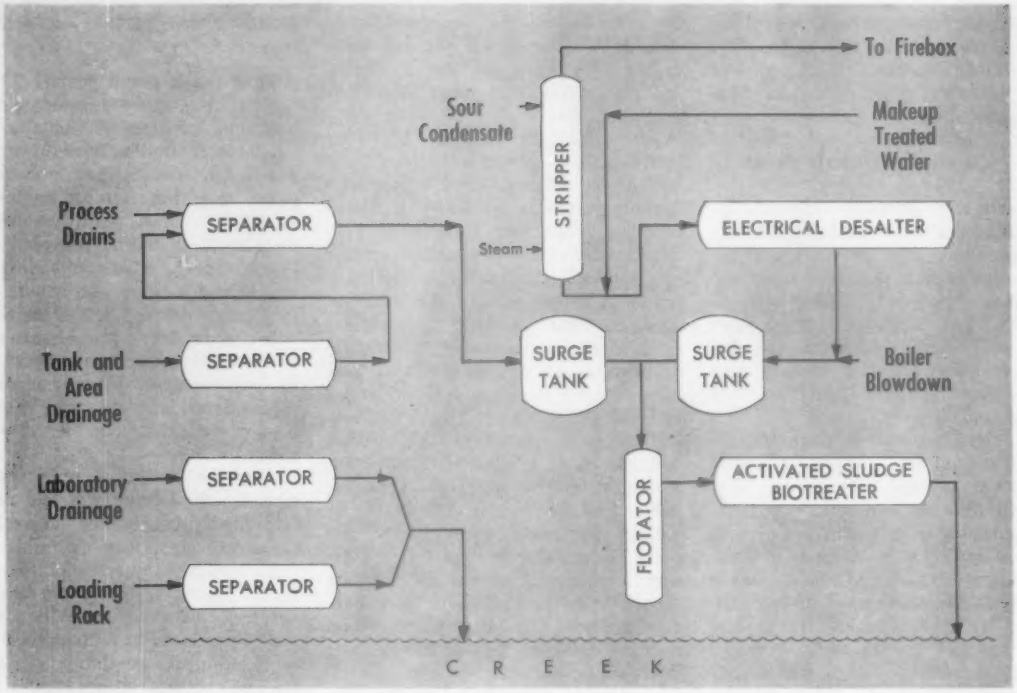
Use the manufacturer's specifications on the horsepower and pressure a pump is capable of delivering. If there are persistent operating problems within the operating limits of the pump, question the pump manufacturer, not the practices. Why shouldn't a pump operate at 3,000 psi. if this is within the pressure limitations quoted for the size liner being used?

There are reasons, of course, why a pump may not operate without excessive trouble and the blame may not necessarily belong to the manufacturer. High pump pressure puts more pressure on pistons, liners, and packing. With clean fluid there will be more failures as pressure is increased.

With a sand-laden fluid the increase in trouble is more than proportional to the quantity of sand present. An increase from 1 to 4% in sand content results in more than a four to one increase in trouble with high pump pressures. There is no need to buy a large pump, design a perfect hydraulics program, select the exact bit nozzle size, and then proceed with a viscous fluid having a high sand content.

The operator under these circumstances has lost the battle before the fighting has begun. The only chance for survival is a close-by supply store overstocked on pump parts and willing to provide the parts free. This is not an exaggeration. Too many operators start jet-bit operations without first considering the fluid properties. At a pressure of 3,000 psi. any type of coarse material that works its way between the piston rubber and liner will cause trouble and frequent repairs.

Give first consideration to the equipment available to do the job. Then consider the material, in this case fluid, to be used in conducting the work. These are the first steps to take in using a good hydraulic program.



TREATMENT SCHEME at Phillips' Okmulgee refinery. Since water from the stripper is reused in the electrical desalter, water consumption has been cut about 8%. Fig. 1.

How Phillips treats waste water

. . . at its Okmulgee refinery

Considerable attention has been focused recently upon the need for expanding our water resources. The petroleum industry has taken a place in the forefront of this movement as demonstrated by the activities of API and other industry organizations. The Oklahoma Oil Refiner's Council has been particularly active in pooling ideas and conducting research toward finding better ways of handling the large amounts of water needed for processing, yet maintaining its purity downstream. Here's how one refinery is working toward this goal of a clean water effluent.

BY KENNETH BROOKS
District Editor

WITH COMPARATIVELY small investment, with units which require very little operator time, and with equipment which occupies little space, Phillips Petroleum Co. has licked many of the problems of waste disposal at its Okmulgee, Okla., refinery. And it has cut water consumption about 8%.

Treatment facilities consist of an activated-sludge bio-oxidation unit and an air-flotation unit. There are no holding ponds, but a creek running through refinery property normally provides about a 3-day retention time.

The air-flotation unit frees solids and removes oil from the refinery waste water. The activated-sludge bio-oxidation unit removes or neutralizes the effect of any polluting chemicals. Further, it greatly reduces the chemical oxygen demand and the biochemical oxygen demand.

Effluent from this treatment typically has a pH of 8.0 and phenols are less than 0.1 p.p.m. Other data:

Ammonia	2.0 p.p.m.
Sulfides	0.0 p.p.m.
Chemical oxygen demand	90.0 p.p.m.
Oil	2.5 p.p.m.
Dissolved oxygen	3.5 p.p.m.

Throughput at the refinery is about 19,000 bbl. per day. Processing includes vacuum distillation, catalytic cracking, and polymerization. The refinery uses about 0.84 volumes of water per volume of crude charge or about 16,000 bbl. per day.

Spent caustic and cleaning acids are either sold or are retained in chemical ponds in the tank-farm area.

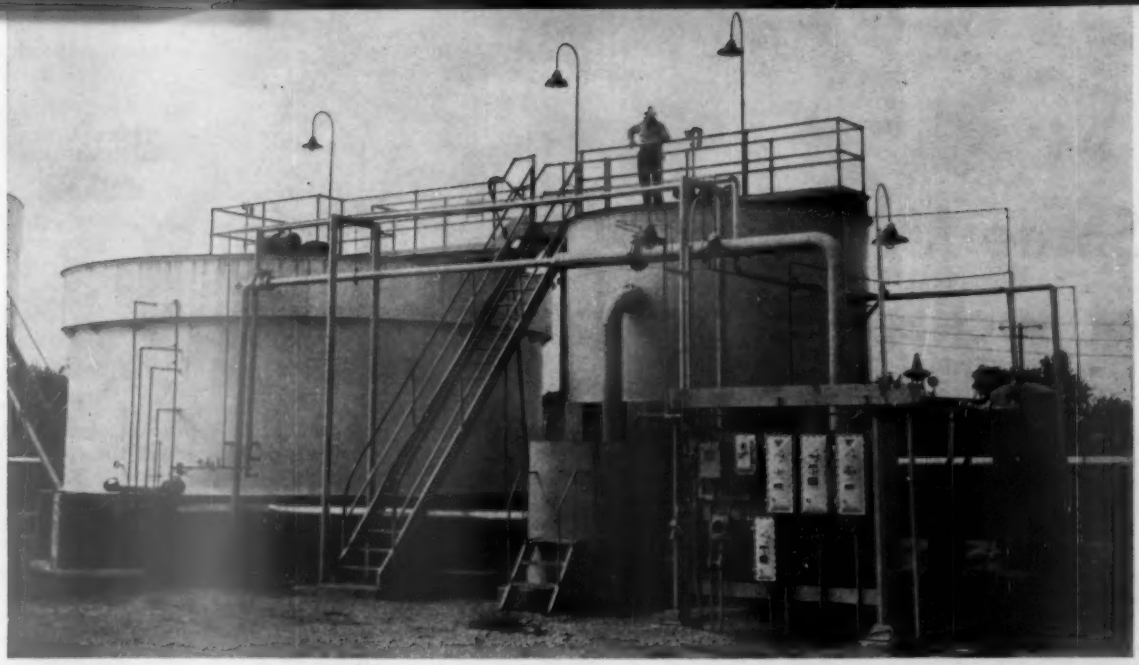
An outline of the treatment scheme is shown in Fig. 1.

Waste water is collected from three sources:

1. Oil-water separators.
2. Desalter water.
3. Boiler blowdown.

Four API-type separators collect and remove most of the oil from waste water.

Water from the control laboratory



AIR FLOTATION and biotreatment units require little effort to operate, but they do a good job. Operation is completely automatic. Fig. 2.

and loading rack is processed through two of the separators and then discharged directly to the creek. Another of the separators collects water bottoms from storage tanks and area drainage. This water is processed again, together with water from the cat and crude unit, through a final separator.

Water from the separators is charged to a surge tank before entering the air flotator.

Sour condensate is collected and steam stripped. Most of the sulfides, ammonia, and large amounts of the phenols are taken overhead here and burned in a furnace. The bottoms stream from the stripper is sufficiently clean to allow it to be reused in the electrical desalter. Be reusing the water in this way, plant water consumption has been cut about 8%, besides reducing the amount of ammonia needed for corrosion control on the crude unit. About 850 to 900 bbl. of water per day is reclaimed.

Representative data on the water to and from the stripper show how effectively it does its job.

	To stripper	From stripper
pH	9.1	9.4
Ammonia, p.p.m.	1,800	175
Sulfides, p.p.m.	3,600	100
Phenols, p.p.m.	350	260
Chemical oxygen demand, p.p.m.	10,000	950

Normally water from the desalter is reasonably oil-free, but a 40,000-gal. tank has been installed downstream from this unit to take care of infrequent upsets. Retention time is about 14 hours. This has proven sufficient capacity to retain oil during those periods of upset. Besides, the tank helps to provide a constant-quality feed stock to the treating section.

Water from the desalter has a pH of 9.1 and a phenol content of 10 p.p.m.

Other data:

Ammonia, p.p.m.	80
Sulfides, p.p.m.	10
Chemical oxygen demand, p.p.m.	250
Oil, p.p.m.	50

Boiler blowdown is joined with the stream from the electrical desalter and flashed into a surge tank. This further reduces the ammonia to acceptable limits. Phosphates in the blowdown help furnish nutrient to the treater.

To help control the temperature in the activated-sludge treater, the water from boiler blowdown and the desalter is not cooled but reaches the surge tank at boiling temperature.

To regulate temperature of feed to the treater, the water is passed over a cooling tower. This method controls the temperature both summer and winter to between 90° and 100° F. to promote bacterial growth.

Water from the oil-water separators, boiler blowdown, and desalter is charged to the flotator where solids and oil are removed. Typical data on the effluent from this unit show:

pH	9.0
Ammonia, p.p.m.	4.0
Sulfides, p.p.m.	3.0
Phenols, p.p.m.	5.0
Chemical oxygen demand, p.p.m.	200
Oil, p.p.m.	10

Next step is treatment in the activated-sludge bio-oxidation unit. This unit is equipped with a mechanical air disperser which breaks up the incoming air into fine bubbles and disperses it through the liquid. It also mixes the incoming waste thoroughly with the mass of bacteria, thus avoiding any localized concentrations of untreated waste. Phillips operates the mechanical aerator to add about 25 lb. of air per pound of chemical oxygen demand removed.

The treater is operated to produce maximum quantities of sludge with good settling qualities. This is primarily done by regulating the quantity of air used in the treater.

Too little air causes bulking of the sludge, floating it off the top of the treater. Too much air causes wet combustion and destroys the sludge. With less sludge, there are fewer bacteria to absorb the chemicals and convert them to harmless materials. Sludge concentration usually varies from about 10 to 35 vol. % with an average of about 15 vol. %. Sufficient wet combustion is maintained so that surplus sludge need not be removed.

Treater flow is completely automatic. The charge pump moves all available water through the treater at all times. Practically no operator time is required. Normally, he inspects the unit and records data every 4 hours, and usually no adjustments are required. The treater has run for weeks without any change by the operator.

Acknowledgment

The help of M. E. McMahon and Roy Umbach, of Phillips Petroleum Co., in developing this material is gratefully acknowledged.

Some factors that affect efficiency of sucker-rod pumps

BY JOSEPH ZABA

PROPERTIES of the pumped fluid make up the first group of factors affecting the volumetric efficiency of a sucker-rod pump. Low viscosity may reduce the efficiency by increasing the leakage past the plunger unless proper fit of the plunger is provided to meet the conditions.

On the other hand, high viscosity may bring about only partial filling of the barrel on the upstroke. Temperature may have several effects: (1) Because of its effect on fluid viscosity, (2) because of its effect on plunger fit if the coefficients of thermal expansion of plunger and liner materials are not the same, and (3) because of its effect on release of gas from solution.

The gravity of oil affects the pumping loads and thus the plunger travel. Water content of the pumped fluid affects its viscosity. Pump leakage is determined by the degree of corrosiveness of the fluid, and by the presence of abrasive materials. Existence of foam conditions sharply reduces the pump's efficiency.

Effect of Well Characteristics

Reservoir pressure controls a well's fluid level and the pump's submergence, and hence, its efficiency. If the displacement of a pump is larger than the well's ability to produce, partial filling of the barrel will result. The well's productivity index is, therefore, an obviously important consideration. The well's depth affects the loads and consequently the plunger travel.

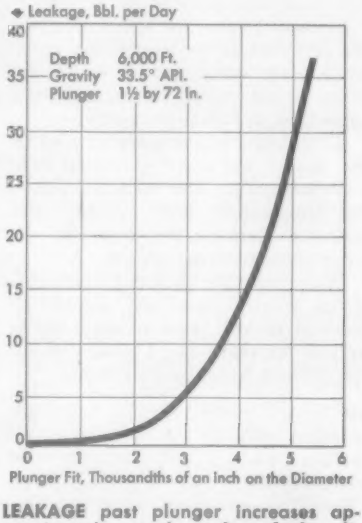
Since volumetric efficiency of a pump is calculated on the basis of barrels of stock-tank oil delivered at the surface, errors can result in some cases in appraising this efficiency if the formation-volume factor is not taken into consideration. Cases have been cited of deep wells in which the volumetric efficiencies calculated on basis of the actual volume of oil at the pump have been as much as 50% higher than efficiencies calculated from volume delivered at the surface.[1]

Effect of Operating Characteristic

Pump submergence, defined as the distance, in feet, between the standing valve of the pump and the well's working fluid level, furnishes the force needed to open the standing valve and fill the pump barrel. It also controls the evolution of gas. Because of its importance, submergence has been a subject of several theoretical and experimental studies and reports.[2 3 4] Some rather elaborate field tests have been conducted to find the effect of submergence on efficiency.

One noncontroversial and rather obvious conclusion of these studies and tests is the fact that for maximum pump efficiency the minimum submergence pressure should exceed the bubble-point pressure of the fluid plus the pressure drop through the pump.

Unfortunately effect of submergence on pump efficiency is only one of the factors which have to be considered. Involved also are the effects of submergence on rate of production and its importance considered from the point of view of the well's sand and gas conditions. In wells with rapidly decreasing working fluid level, such as those producing from volumetric control reservoirs, the economics of frequent adjusting of submergence becomes important. In wells of this type, setting the pump at the lowest expected level may be sometimes desirable during the initial run of the pump.



LEAKAGE past plunger increases approximately as the cube of the diametral clearance between the plunger and pump barrel. Fig. 30.

Characteristics of the pumping cycle, the length of stroke, and the speed of pumping affect plunger travel and, what follows, efficiency. They may also have a direct effect on efficiency. For instance, too-fast speed of operation may not permit proper filling up of the barrel. Relationship between speed of plunger travel and pump's efficiency has been a subject of several investigations.[4 5 6] These dealt with specific sets of conditions and the results cannot be generalized. Also, as in the case of submergence, the speed of pumping must be considered from a number of points of view in addition to that of the pump's efficiency. Included would be the effect of speed on loads, and on life of rods with the increasing depth of pumping.

Effect of Pump Characteristics

Leakage by even slightly worn valves may substantially reduce the pump's efficiency.

Bruce H. Robinson was one of the first to report on the studies of leakage past the plunger.[7] He found this leakage to vary about as the cube of the fit of the metal plunger, Fig. 30, and it varied directly with the depth and the plunger diameter and inversely with the length of plunger and the viscosity of the oil. Glenn M. Stearns presented results of rather extensive tests on the subject conducted under the sponsorship of the API Mid-Continent District Topical Committee on Production Practice at University of Oklahoma.[8] For the conditions of tests this leakage was found to be negligible for the metal plunger fit between 0.001 and 0.002 in. and considerable for fits of 0.003 in. or greater. Kenneth N. Mills suggested the following formula for slippage past a metal plunger:[9]

$$S = \frac{1.382\ \pi\ dDC^3}{UL\ 10^{-8}}$$

Where:

S = slippage past plunger, barrels per 24 hours
d = plunger diameter, in.

D = depth to pump in thousands of feet
C = diametral plunger clearance, in.
U = absolute viscosity of fluid, cp.
L = length of plunger, in.

Since, for given conditions, the slippage is inversely proportional to the length of the plunger, this length is used for control of slippage. For depth up to 6,000 ft. 12 in. of plunger are generally used per each 1,000 ft. of depth, with 24 in. a minimum length. Below this depth 10 in. are added for each 1,000 ft. of depth. For severe paraffin conditions 12 in. of plunger are usually added to overcome the effect of additional pressure caused by paraffin accumulation.

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BOOK

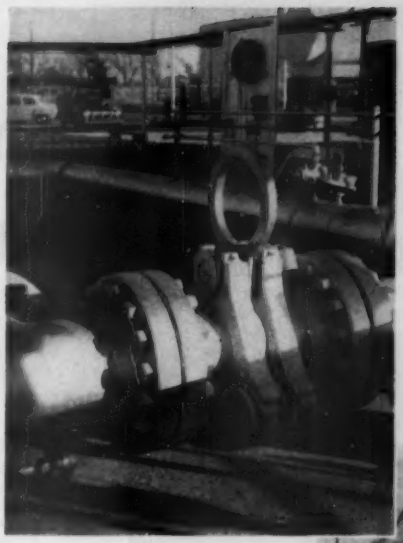
COST ENGINEERING IN THE PROCESS INDUSTRIES. Edited by Cecil H. Chilton. Published by McGraw-Hill Book Co., Inc., 330 West Forty Second Street, New York 36. 502 pp. $11.

Facts and data needed for making cost and profitability analyses are presented in this new book.

It discusses accepted methods, specific data, and principles useful for making estimates of plant, equipment, and operating costs; in predicting both expected earnings and required capital investment; and in making management decisions at the optimum profit level for a company.

Standards are outlined which are adaptable to the many stages of the cost engineers' job, from figuring the cost of a process plant, to pricing a small piece of equipment. Cost indexes are included to keep the data up to date.

The book is based on articles written for "Chemical Engineering" by more than a hundred cost-engineering specialists.



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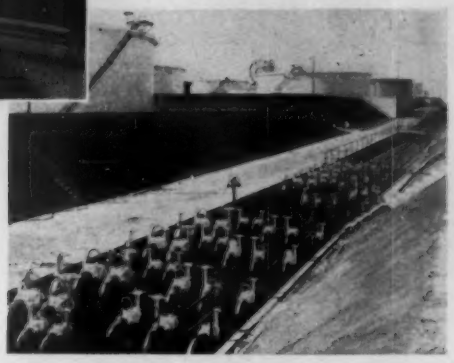

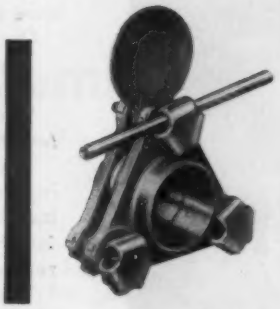

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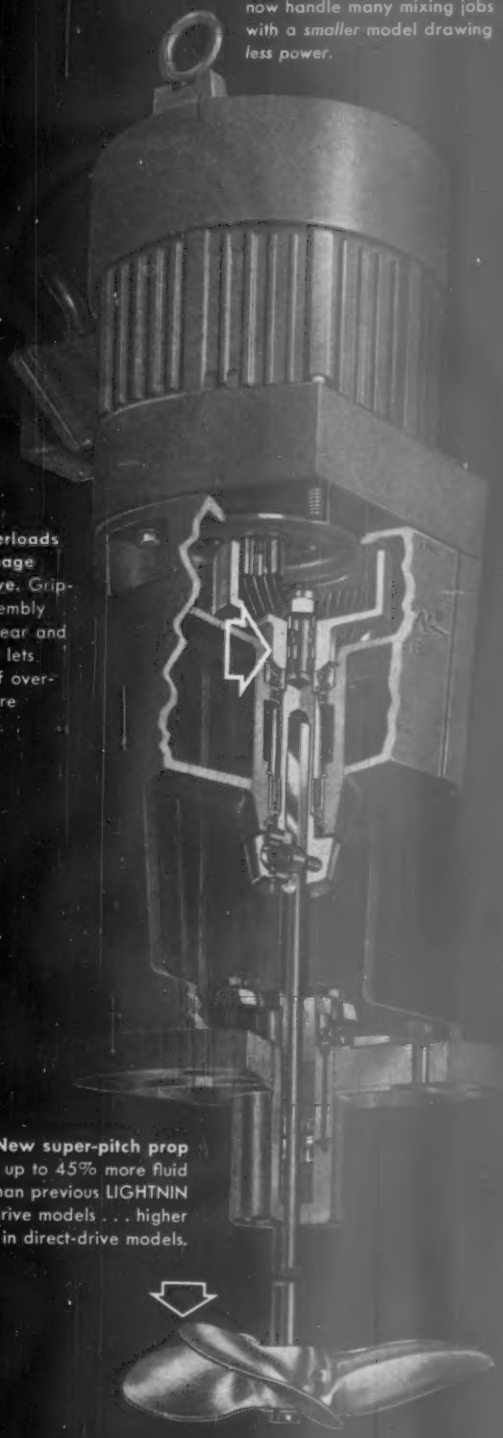

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In Canada: Greey Mixing Equipment, Ltd., 100 Miranda Ave., Toronto 19, Ont.

THE PLANT has some process equipment and instrument control panels inside buildings, and has other instruments mounted outside in the plant for local control.

New petrochemical plant on stream

FIRST PHASE of revamping and construction has been completed by Jefferson Chemical Co., Inc., at its Conroe, Tex., plant that it bought from Gulf Oil Corp. in early 1960.

Jefferson will use the plant for several purposes. First, it will make specialty chemicals. Other uses are for intermediate-scale production of new products and larger-scale development of new processes pilot-planted at its Austin, Tex., research laboratories.

The plant's first products are polypropylene glycol, propylene oxide triols, and morpholine. Jefferson did not release capacity figures.

The first two products are used to make rigid and flexible polyurethane foams. Morpholine, an ethylene oxide derivative, is an intermediate for surface-active agents, rubber-curing agents, and corrosion inhibitors.

Plans are in progress for adding other chemicals to the plant's product list.

The Conroe plant was built originally in 1954 by Warren Petroleum Corp. to develop a hydrocarbon oxidation process. It became part of Gulf Oil in 1957 when Gulf bought Warren. Gulf sold the plant to Jefferson for an undisclosed price in early 1960 as part of a consent decree with the FTC (OGJ, Jan. 18, p. 52).

Jefferson says it bought the Conroe plant because it needed an adequate site for making speciality chemicals (even though it had recently completed a major expansion at its Port Neches, Tex., plant). The Conroe plant was well suited for immediate needs with a minimum of modifications.

BY H. C. BOZEMAN
Gulf Coast Refining Editor

The plant had the basic features and was an excellent location for future expansion, Jefferson says. It is located on an 85-acre tract. The plant has 32 employes. Harold R. Horner is plant manager.

The existing plant equipment was used whenever possible in the revamping project. Its stainless-steel and high-alloy construction will help Jefferson maintain product purity specifications. Brown & Root, Inc., was the contractor for revamping.

The plant is built for around-the-clock operation. It has some process equipment and instrument control panels inside buildings and has other instruments mounted outside for local control.

Processing. The Conroe plant makes many different molecular-weight polypropylene glycols and propylene oxide triols. Close control of reaction quantities are needed to obtain the desired molecular weight. Reaction kettles are mounted on scales to combat inaccuracies of flow meters and other devices in measuring low, intermittent, and small-volume flows.

The batch reaction product is finished continuously and pumped to segregated storage through a complex manifold system until it is shipped in drums, tank trucks, or tank cars.

Waste products from the plant are evaporated from ponds to prevent contamination of surface waters.

Background. Jefferson Chemical Co. was formed on a joint and equally owned basis in November 1944 by Texaco Inc. (then The Texas Co.) and American Cyanamid Co. Texaco provided personnel and knowledge of the petroleum industry, and Cyanamid provided personnel and knowledge of chemical production and marketing.

Jefferson selected for its first plant, a 1,100-acre site near Port Neches, Tex., and has developed 175 acres. Its propane-ethane feed stream comes from Texaco's Port Arthur refinery 5 pipeline miles away.

Ground was broken in spring 1946 for the first units. These were to make ethylene oxide and ethylene glycol. Construction was finished by the end of 1947 and in February 1948 the plant made its first shipment of ethylene oxide. The plant has expanded several times since then and has added many new process units and products.

Jefferson bought in Austin, Tex., in 1948, facilities for a research laboratory and has centralized research there. The company moved its headquarters from New York City to Houston in 1955 to consolidate all production, research, and administration in Texas. The Conroe plant is the company's newest facility.

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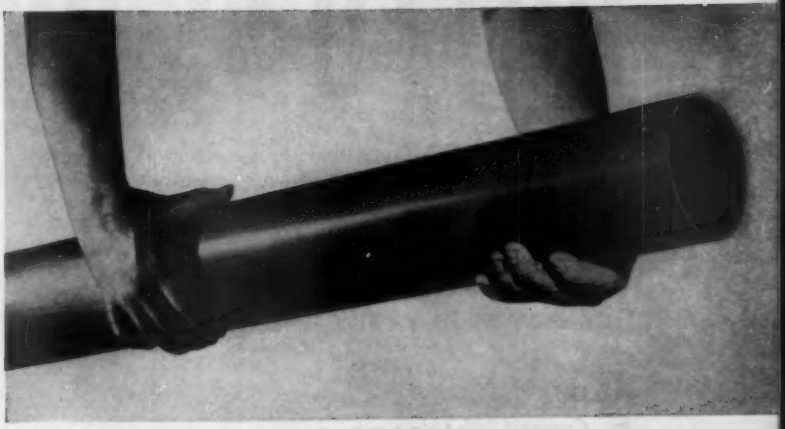

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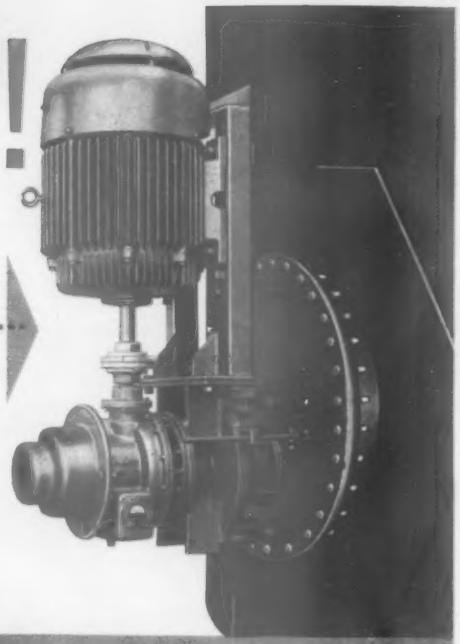
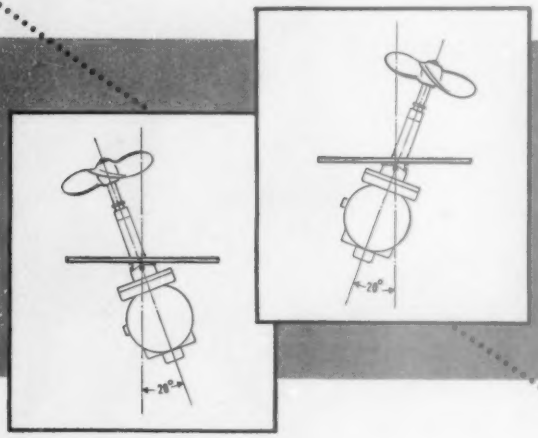
BOTTOMS UP!

JENSEN Mixers provide a method of sweeping crude tank bottoms, thoroughly and economically, regardless of tank conditions, size, or location.



ELECTRIC-POWERED VARI-ANGLE MIXER

- Light Weight
- Compact with little overhang
- Electric powered for 500 to 200,000 barrel tanks
- Jensen Vari-Angle feature



Jensen Vari-Angle Mixer is adjustable, even during operation. The mixer produces a directed flow stream by varying the angle of the mixer 20° on either side or a total sweeping action of 40°. This complete sweep prevents bottom settling and removes accumulated deposits—HENCE BOTTOMS UP.

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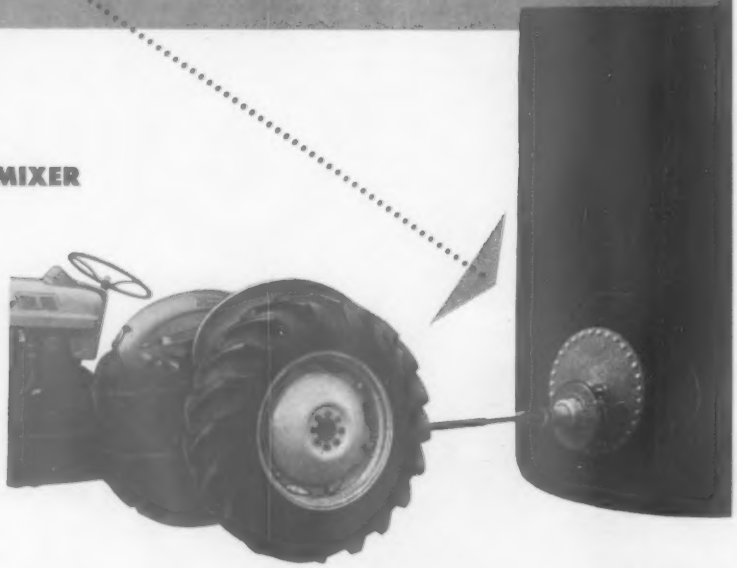
- Standard Tractor
- Standard Tractor PTO
- Diesel powered for 500 to 200,000 barrel tanks
- Jensen Vari-Angle feature



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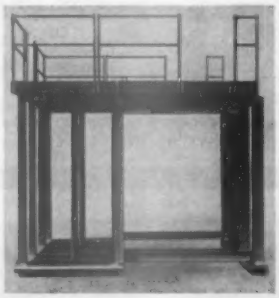
▶ ▶ ▶ New Equipment Section

This week's SHOWCASE features . . .

Portable oil heater

. . . mounted on a truck is designed to remove paraffin and wax from tubing and flow lines of oil wells at all depths. According to the maker, the truck-mounted unit can also be used to pump hot oil into the formation of wells and into casing perforations to open up the formation and stimulate well production.

Still another use is that of heating and treating crude oil in storage tanks. The heating coils are 2-in. pipe with 180° return bends. They are welded together to make layers. The unit is fired with LPG, and capable of heating at rates up to 8 M.M. B.t.u. per hour. Source: **Southwest Welding Co., Box 305, Wichita Falls, Tex.**



"Wide-open" substructure

. . . has been designed to eliminate the problem of handling big wellheads, multiple flow lines, and large fracturing or treating heads.

As described by the maker, the substructure offers a way for fast rigup and rigdown as it can be set in place around the wellhead and the trucks released. After nippling down, the drop-in rotary table and floor sections can be put in place with the traveling block. After the unit is assembled, it provides a 7 ft. 4 in. by 16 ft. area around the well. Source: **Cardwell Mfg. Co., Box 2001, Wichita, Kan.**

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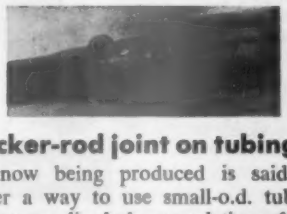

Sucker-rod joint on tubing

. . . now being produced is said to offer a way to use small-o.d. tubing to pump slim-hole completions from greater depths than has previously been considered possible. The "macaroni" sucker rod is a product which has a mechanical joint for macaroni tubing similar to a sucker-rod joint where the stresses of bending and loading are passed through a shoulder rather than through the last engaged thread. Source: **Vinson Supply Co., 220 N. Boston, Tulsa 3, Okla.**

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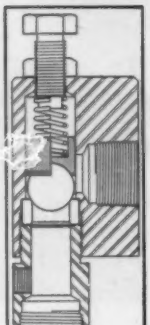
New valve to vent casing



. . . is available for pressures from 0 to 100 psi. The adjustable pop valve is designed to vent casing, yet to retain any desired back pressure within the operating range for the operation of engines or heaters.

The body is made of a solid block of rolled steel measuring 1½ by 2½ by 3½ in. The ball and seat, size 1½-in. API, are replaceable. The gage has a 1-in. inlet and outlet and a ¼-in. hole for the gage. Source: **Baird Mfg. Co., Box 380, Tulsa, Okla.**

●

Valves with hard-faced seats

. . . on the market are made of forged steel with flanged ends and bolted bonnet. The valves come in gate, globe, and check types in three ASA ratings: 150, 300, and 600 lb.

The valves not only have hard-faced

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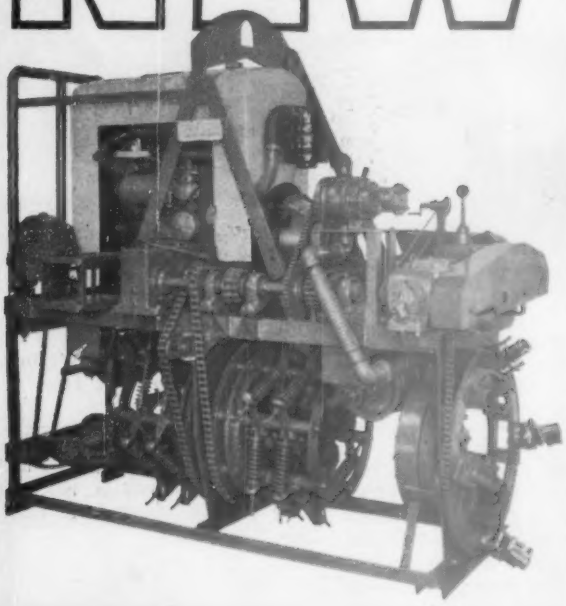

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AVAILABLE IN FOUR MODELS

The New Crose Combination Cleaning and Tape Wrapping Machine has variable speed tape wrapping head; built-on blower to remove dust from pipe prior to applying tape, and baffles incorporated into machine's design to protect wrapping area from dust. Four models — comparable to the Crose Cleaning and Priming Machine — handle these pipe sizes: 2″-4″; 4″-16″; 16″-32″ and 34″-40″.

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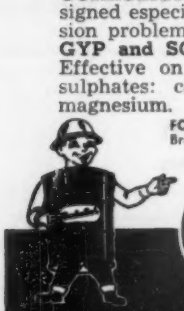

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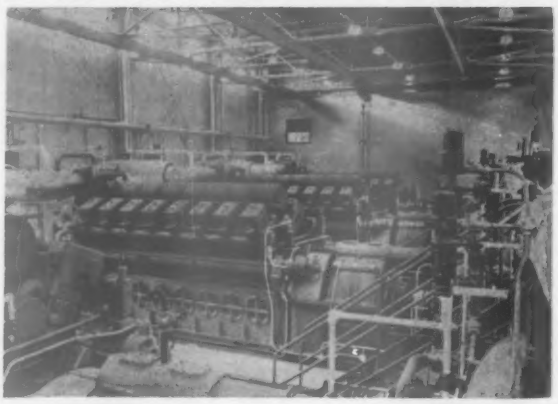

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Kittell's unique louvred design stops damaging back surge. As exhaust gases enter the silencer they are instantly bled off by a special perforated tube, then directed through louvres along the outer shell which cools them and reduces their volume. More louvres guide them back into the center of the silencer and then out into the atmosphere. This efficient design smooths pulsations, produces a whisper-quiet, exhaust flow. Available in a variety of sizes and designs for every noise application. Write for catalog.

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seats but also hardened wedges and disks, spiral-wound body-bonnet gaskets, stainless-steel gland studs and nuts, and interchangeable parts. They come in sizes of ½ to 2 in. Source: **Henry Vogt Machine Co., Box 1918, Louisville, Ky.**

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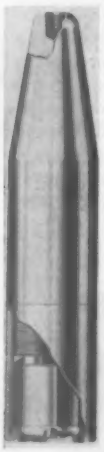
Element for junk catcher



. . . is a magnetic type available to increase the versatility of the Globe junk catcher. According to the maker, the magnetic element makes the junk catcher suited for standby service on a drilling rig. The sinker bar and head encompass the maker's standard magnetic element, making it suitable for sand-line operation.

The tool is said to be especially suited to run before diamond coring. The thread on the lower end of the sinker bar accommodates the conventional junk-catcher head, and the box on the upper end is machined to specifications for the sand-line rope socket. Source: **Globe Oil Tools Co., 11630 Burke, Los Nietos, Calif.**

●

Resistance to corrosion

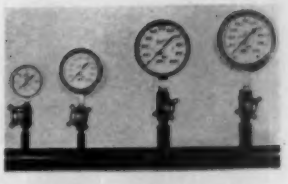
. . . either internal or external, or both, is offered by a line of bimetallic pipe now available in a variety of base pipe and lining materials. According to the maker, the bimetallic pipe provides the fabrication and strength advantages of a carbon steel system, combined with the corrosion resistance of the best alloy materials, at less cost than solid-alloy piping.

In the manufacturing process, a seamless lining is hydraulically expanded into the base pipe. This forms the lining tightly against the inside of the base-pipe material. Additional pressure expands the base pipe. On return to normal operating pressure, the lining is firmly held against the base pipe due to differential contraction. Source: **Gray Tool Co., Box 2291, Houston 1, Tex.**

Two new additives

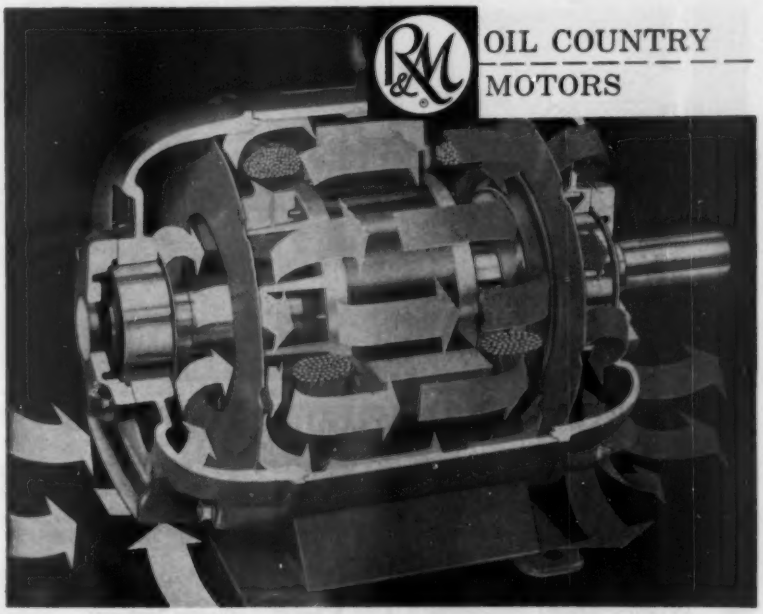
. . . for fuel and lubricants are now available. The first is a metal deactivator or chelating agent for addition to gasoline, jet fuel, and distillates to counteract the harmful effect of copper on fuels. The metal deactivator chemically combines with the copper particles to prevent oxidation of the fuel.

The second additive, antioxidant ZDP, can be added to lubricating oil to act as an antioxidant and a mild extreme-pressure additive, according to the maker. Source: **Ethyl Corp., 100 Park Ave., New York 17, N. Y.**



Four gage types

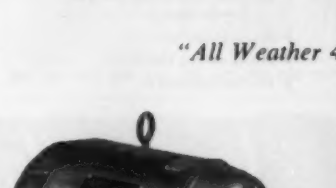
. . . offered in a new line now on the market. The gages come in 49 pressure ranges and four dial sizes. The S-B-C gages come in capacities from 1,000 to 10,000 psi. and in dial sizes from 2 to 4 in. Source: **Skinner Bros. Co. Inc., Box 13556, Dallas, Tex.**



COOL R&M Performance

Increases bearing grease life 52%

New Robbins & Myers "All Weather 40" Oil Country Motors have a heat rise of only 40° C. with rodent screens installed, compared to 55° or higher for other makes of motors. A leading bearing manufacturer proved grease lasts 52% longer when rise drops from 55° to 40° C. Cooler performance by R&M motors means less maintenance, longer bearing life, longer service intervals. When you consider buying motors from 1 through 200 HP, remember that Robbins & Myers Oil Country motors give you these important maintenance savings. Write for Bulletin 520-OG



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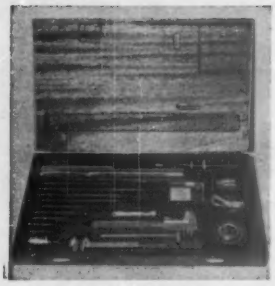
MOTOR DIVISION • SPRINGFIELD, OHIO



Kit to aid meter checks

. . . to determine if orifice metering assemblies meet the tolerances recommended by AGA and ASME is available. Included in the measuring-tool kit's mahogany carrying case are 27 separate pieces. These include the maker's "bean" orifice edge gage.

According to the maker, the check kit makes it possible to measure the meter-tube diameters and lengths, meter tap holes, orifice-plate bores, outer diameters, flatness, and edge sharpness. Source: **Daniel Orifice Fitting Co., Box 19097, Houston 24, Tex.**

●

Blowout-preventer move

. . . is easy with a unit now available that weighs only about one-half that of older types, yet it handles the same pressure ratings, according to the maker. The Model LWS unit is now made in a 6-in. API Series 1500 size and rating with a working pressure of 5,000 psi. The vertical bore is capable of handling pipe diameters to 7⅞ in.

The new model comes in both single and double-gate arrangements. The double-gate design has two ram compartments unitized into one body. One compartment has rams for shutoff of an open hole. The other has rams for closing off around drill pipe. The unit thus provides blowout protection whether the pipe is in or out of the drill hole. To obtain the low weight combined with high strength in the blowout preventer, the maker uses a "deep rib" casting technique. Source: **Shaffer Tool Works, 209 S. Pomona Ave., Brea, Calif.**

●

Internal-coated line pipe

. . . is available from a pipe maker. At the plant, the interior surface of the pipe is prepared with a scrubbing and rinsing process with heat added before and after these operations. Final painting is then done under controlled venting conditions.

Both the composition of the coating and the application methods are specified by the pipe user. Present equipment permits coating pipe with diameters from 16 to 39 in. Source: **A. O. Smith Corp., 3533 N. 27th St., Milwaukee, Wis.**

●

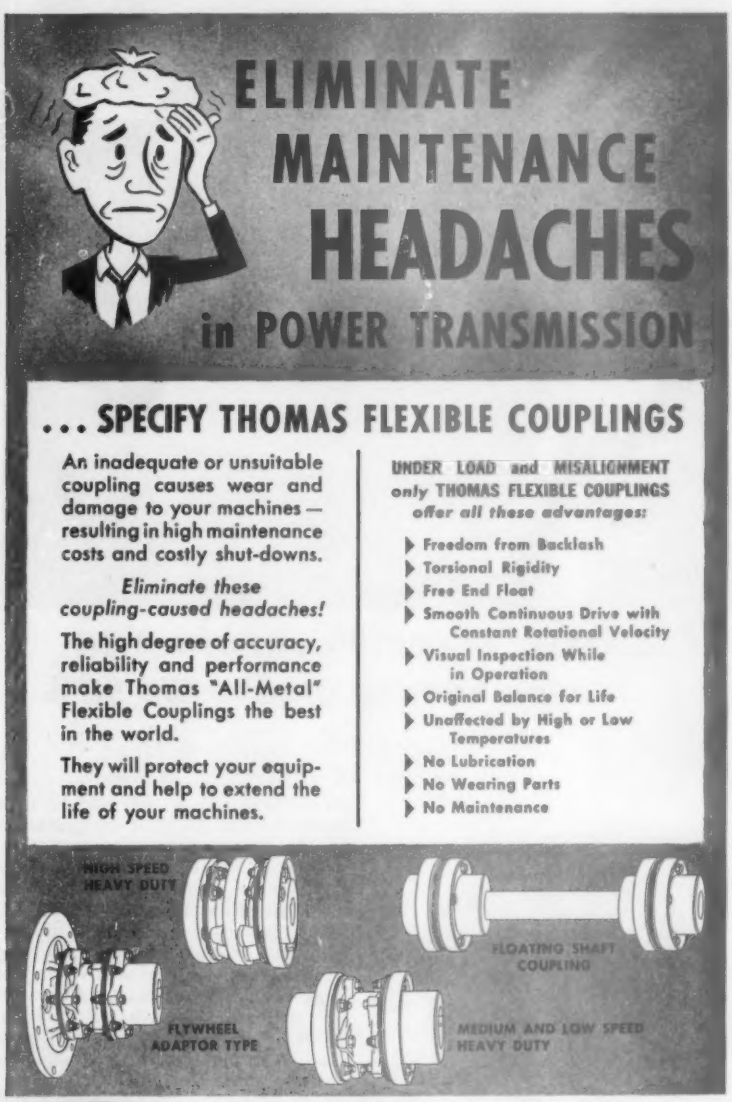
Aid for secondary recovery

. . . of oil recently disclosed was developed to inhibit growth of harmful bacteria in oil-well formations and also to act as a corrosion inhibitor. Tradenamed Adoquat, it is a quaternary ammonium product. Source: **Continental Oil Co., Box 2197, Houston, Tex.**

●

New drilling-mud additive

. . . now on the market, called Soltex, can serve a number of purposes, the maker says. It can be used to stabilize shale sections, as an emulsifier for fresh or salt water, as an extreme-pressure lubricant, to inhibit dispersion of drilled solids, and to make mud resistant to high temperature.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An inadequate or unsuitable coupling causes wear and damage to your machines — resulting in high maintenance costs and costly shut-downs.
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The high degree of accuracy, reliability and performance make Thomas "All-Metal" Flexible Couplings the best in the world.
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MAINTAINS TIGHT SEAL
EVEN WHEN DRAG SECTION
CHANGES POSITION IN CASING

This versatile and flexible "U"-Seal offers NEW ECONOMY in casing seals.

The special demonstrator pictured shows the flexibility of the "U"-Seal. The pipe position changes, but the seal remains tight. A special fungus and bacteria retardent is added to the compound for extra protection. Seals available in sizes 2" and larger.

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The fully reversible "U"-Seal is easy to install in the new "U" shape or in WmSon's familiar "Z" shape. A screwdriver is the only tool needed to tighten the two stainless steel bands. Send for technical bulletin.

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Write Dept. A2 for Bulletin A-281

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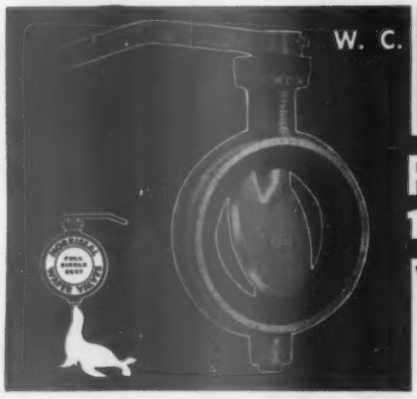

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Field Tested and Approved
150 psi working pressure

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SCALE PROBLEMS?

INHIBITED ACID

Bulk Inhibited Hydrochloric Acid has many uses to help solve both maintenance and production problems. For instance, Dowell Inhibited Acid is useful for cleaning scale and gyp from producing formation, tubing and lead lines; cleaning scale from piping, valves, fittings and nipples; dump-job treatments in old dolomite or limestone wells. Particularly suited to do-it-yourself treatments. Available in bulk lots at all Dowell stations. Economical.

Products for the oil industry

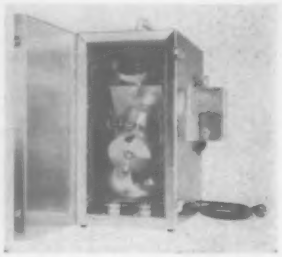
DOWELL

DIVISION OF THE DOW CHEMICAL COMPANY

DIAL DOWELL

The product is a modified high-molecular-weight hydrocarbon compound in flake form and is soluble in both oil and water. It can be added through the mud hopper or by agitation with the mud guns or mixers. The maker says it is compatible with all presently used drilling-mud formulations. Source: **Drilling Specialties Co., Bartlesville, Okla.**

●



Latest aid to mud tests

. . . is a portable field oven that promises to provide fast, accurate testing of drilling mud stability at high temperature. Measuring 9½ by 15⅞ by 17 in., the oven weighs 46½ lb. and can be used to test two or four mud samples at the same time. In testing, the samples are sealed in stainless-steel containers and mounted in brackets on a rack which can be rotated at 32 r.p.m.

The oven can be wired for 7½ amp. at 110 volts a.c. or 3.75 amp. at 220 volts a.c. without modification, the maker says. Source: **Magnet Cove Barium Corp., Box 6504, Houston 5, Tex.**

●

Shunt for current tests

. . . on cathodic-protection systems when the amperage exceeds 5 amp. is available. The shunt is a 50-amp. (maximum) 100 mv. type. It is designed to fit permanently into the lid of the maker's pipe-to-soil voltmeter. The voltmeter has 50 and 100 mv. ranges. Thus it can be used as a 25-amp. 50-mv. shunt or a 50-amp. 100 mv. shunt. Shunt length is 5 in. Source: **Agra Engineering Co., 1537 E. 10th, Tulsa, Okla.**

Sauder's Econo-Pak is the **original** winterized indirect heater/oil and gas separator combination that set the trend in the industry! **Fully winterized,** the ECONO-PAK gives continual unattended operation day in and day out — when others freeze up! All instruments, controls, and critical piping are inside a heated insulated enclosure. **An economical package... unconditionally guaranteed!** Backed by 36 years of oilfield engineering experience!

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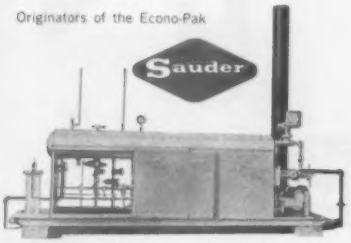
SELLS GAS IN SEVEREST COLD WEATHER!

Originators of the Econo-Pak



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Specially designed and manufactured for storing sand samples. They will last and serve for years. Immediate delivery of any quantity.

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Corrugated and solid Kraft Fiber Boxes for storing sand samples. Carried in stock.

Gara Boxes built to specifications

TULSA PAPER CO.

P. O. BOX 30 TULSA 1, OKLA.

ROTARY OR CENTRIFUGAL

...Which one is best for your application?

Rotary or centrifugal? Sometimes the choice is easy. For example, you would use a rotary pump for very viscous liquids (over 2500 s.s.u.). Or where poor suction conditions exist. Or when positive displacement is required. Centrifugal pumps would be used for extremely corrosive or abrasive liquids, low viscosity liquids (under 2500 s.s.u.) water, slurries, or petroleum products.

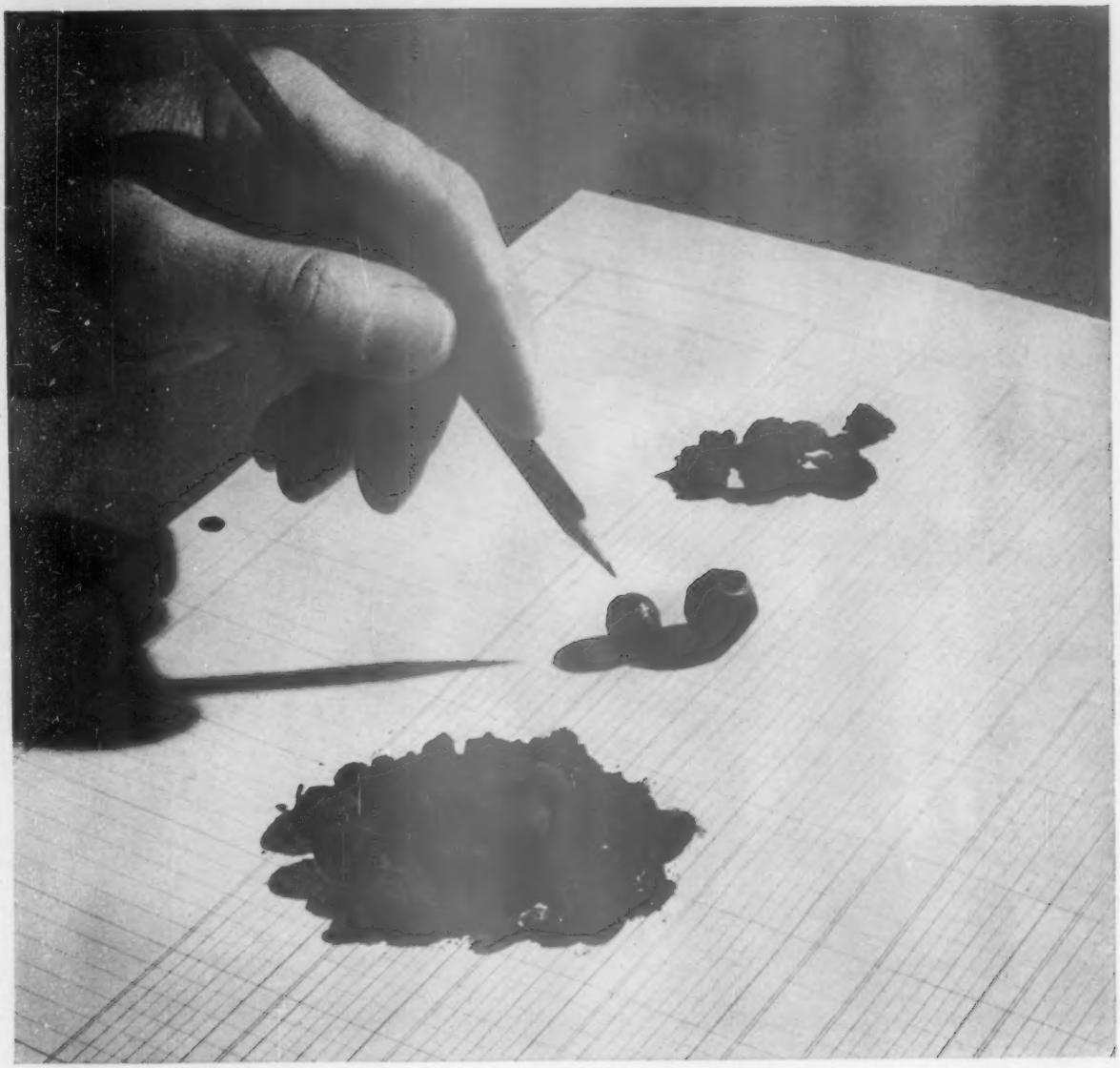
But . . . in many applications combinations of these factors exist. Or the liquid you want to pump is not clearly in either area. Then there are other considerations such as initial cost, operating cost, lubrication value of the liquid, location and even budget limitations.

All of these considerations can put you in the middle—where either a rotary or centrifugal can be used. The best choice can only be made by someone with experience and knowledge of both types.

As one of the few manufacturers of a complete line of both rotary and centrifugal pumps, Worthington can help you select the best, most economical solution to this perennial pump problem. For the name and address of your nearest Worthington representative, consult the yellow pages.

P.S. If you'd like a copy of a 50-page booklet, "Rotary and Centrifugal Pumps: Theory and Design," please write to Worthington Corporation, Section 20-14, Harrison, New Jersey, for bulletin G-2666.

WORTHINGTON



Specimens of copper powders, balls and balled sheets which can be removed from high-pressure boilers by the M-50 treatment.

M-50 REMOVES THESE COPPER TROUBLEMAKERS FROM BOILERS, FAST!

The M-50 single-stage, patented treatment* for high-pressure boilers removes copper deposits and other scales in record time. With this exclusive Dow Industrial Service treatment, copper does *not replate* on clean boiler surfaces during treatment, and small quantities of M-50 in future cleaning will help *keep* boilers copper-free. To date, the M-50 treatment has cleaned more than 300 boilers.

Copper deposits, common in many high-pressure boilers, reduce heat transfer efficiency and cause localized corrosion, overheating and subsequent ruptures. Copper particles slough off, reducing circulation.

Dow Industrial Service developed the M-50 treatment to remove troublemaking copper and other deposits at the same time. In cases of excessive metallic copper deposits, a preliminary treatment may be desirable.

D.I.S. cleans all kinds of equipment . . . boilers, process equipment, pipelines, water wells, to name a few . . . for every kind of industry. With many methods to choose from, D.I.S. engineers first analyze each job to pick the technique best suited to the specific problem.

D.I.S. also offers complete consulting laboratory service for water treatment and waste processing, backed by the technical resources of The Dow Chemical Company. For fast "total" cleaning of any industrial equipment, anywhere in the U.S.—and for literature on copper removal by the M-50 treatment —write or call DOW INDUSTRIAL SERVICE, 20575 Center Ridge Road, Cleveland 16, Ohio. *Patent No. 2959555

DOW

DOW INDUSTRIAL SERVICE • Division of The Dow Chemical Company

SHOWCASE . . .

New Literature

Diamond-core drill

. . . known as Prospector (gasoline-powered and skid-frame-mounted), is outlined in new two-page Bulletin 91 now obtainable. The drill is said to be light and efficient for general scout drilling and foundation testing. The literature contains a photo along with rated capacities, weights, dimensions, bit speeds, and other specifications. Source: **E. J. Longyear Co., Foshay Tower, Minneapolis, Minn.**

Statistical Data Reduction

. . . and Control Systems is the title of Technical Memorandum 1 which discusses methods for increasing efficiency of data reduction and automation systems for quality control, continuous processing, and large-scale experimental work. The 18-page bulletin stresses the need for statistical reduction of data before readout. Source: **Monitor Systems, Inc., Fort Washington Industrial Park, Fort Washington, Pa.**

Sight glasses

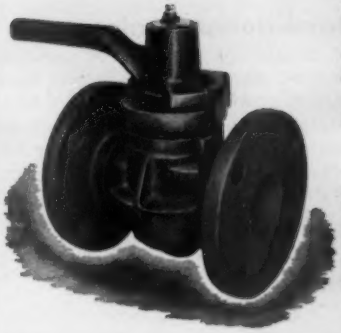
. . . for use in absorption columns, furnaces, and processing tanks are detailed in Bulletin EB-20, which contains property data and installation information on Pyrex and Vycor brand sight glasses. It also covers product specifications and data on pressures and temperatures. The four-page literature piece includes information on gasketing and mounting, and offers a full page of pointers on the use and care of the glasses. Source: **Corning Glass Works, Corning, N. Y.**

Conversion-factor table

. . . in a new vest-pocket size, deals with weight-volume, gravity of light and heavy liquids, base weight, power, temperature, pressure, flow, and length area. Source: **Ohmart Corp., 2236 Bogen St., Cincinnati 22, Ohio.**

Gas chromatograph

. . . with tape programing for high operating precision and flexibility, is described in new four-page Bulletin 0714-5. According to the literature, the unit has a high degree of stability in column temperature and permits either bar graph, spectrum, or manual chromatographic presentation. Photographs and diagrams are used to illustrate the controller, contained in a locked dustproof housing, and the analyzer, in an explosionproof housing: Source: **Mine Safety Appliances**



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POSITIVE SHUT-OFF • FREEDOM FROM MAINTENANCE • EASY OPERATION • ON-OFF or THROTTLING SERVICE • RESISTANCE TO CORROSION or EROSION

This DeZurik Valve will deliver more valve value than any other valve!

In sizes from ½" thru 24", with a complete line of actuators for remote and automatic operation. Write for details, or see the DeZurik representative in your area.

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H&M PRODUCTS FOR PROFITABLE PIPE CUTTING AND BEVELING

STD. MACHINES
FAST, accurate cutting and beveling of all sizes of pipe from 1½" - 36". Simple operation . . . operator can master machine in a matter of minutes.
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"BEVEL-LAND" GRINDER
No more time consuming handwork. "BEVEL-LAND" smooths pipe cuts and accurately places the lands on bevels in a matter of seconds.
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Insures even, accurate cuts of irregular pipe. Roller rides pipe surface . . . makes cutting easy, simple. Fits all H&M Machines.
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Accurately cuts saddles, tees, els and other irregular shapes. Lightweight, extremely portable . . . fits all H&M Machines.
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WRITE FOR CATALOG SHEETS AND PRICE LISTS ON THE COMPLETE H&M LINE.

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Co., 201 N. Braddock Ave., Pittsburgh 8, Pa.

Stream-cooled motors

. . . are discussed in a new four-page bulletin, just published and free for the asking. Included are photographs and a full-page cutaway drawing. The literature piece breaks down the motor into its component parts and gives a complete description of each—monocast stator frame, rotor, and plates, locked ball bearings, and brush assembly. Source: **Baldor Electric Co., 4353 Duncan Ave., St. Louis 10, Mo.**

Band-clamp catalog

. . . consists of 44 pages of information on industrial band clamps, hose clamps, couplings, flanges, and V-band joints for various uses. Dimensional and operating data, along with product advantages, are included. Source: **Marman Div., Aeroquip Corp., 11214 Exposition Blvd., Los Angeles 64, Calif.**

Pneumatic controllers

. . . Catalog J-C discusses instruments that control pressures up to 10,000 psi. and temperatures from —125° to 1,000° F. The six-page publication gives features, accessories, dimensions, specifications, materials of construction, and engineering data. It also tells when to use a controller. Source: **OPW-Jordan Corp., 6013 Wiehe Rd., Cincinnati 13, Ohio.**

Deterioration of wood

. . . . in cooling towers—including causes, symptoms, and suggested cures—are described in eight-page Reprint 85. The study is divided into two parts. The first describes the three principle types of deterioration found in wood towers—leaching, delignification, and microbiological attack—and tells how they can be discovered by inspection. The second part outlines corrective measures that can be taken to provide effective control of the three types of attack. Source: **Nalco Chemical Co., 6216 W. 66th Pl., Chicago 38, Ill.**

Portable lighting systems

. . . Bulletin B76 shows how lamps, extensions, sockets, and other unitized assemblies can be connected to form economical lighting systems. The 12-page illustrated bulletin provides data on the types, construction details, and varieties of stock components from which individualized portable lighting systems can be assembled. Source: **Electrical Products Div., Joy Mfg. Co., 1201 Macklind Ave., St. Louis 10, Mo.**

Pumps to control, regulate

. . . large volumes of water are discussed in newly issued Bulletin B-148. It gives complete details of different pump types, along with rendered sectional views of various component parts. Other sections deal with types of available drives and photos of installations. A full page of diagrammatic drawings showing typical Hydro-Foil pump-station arrangements is also included. Source: **Peerless Pump, Hydrodynamics Div., Food Machinery & Chemical Corp., 301 W. Ave. 26, Los Angeles 31, Calif.**

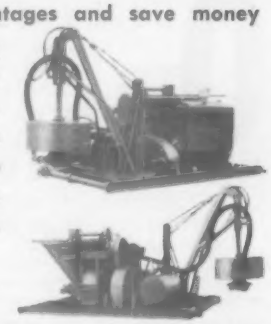
Pipe-coating and wrapping

. . . procedures are explained in a new 16-page brochure obtainable now. The publication discusses the company's production flow, beginning with storage when the pipe first enters the yard, on through to loading the coated pipe after the entire production operation is completed. Also included are sections on importance of bond, special features, standard specifications, and instructions for ordering. Source: **Standard Pipeprotection, Inc., 3000 S. Brentwood Blvd., St. Louis 17, Mo.**

New Mudmixer Makes Other Mixing Methods Obsolete and Costly

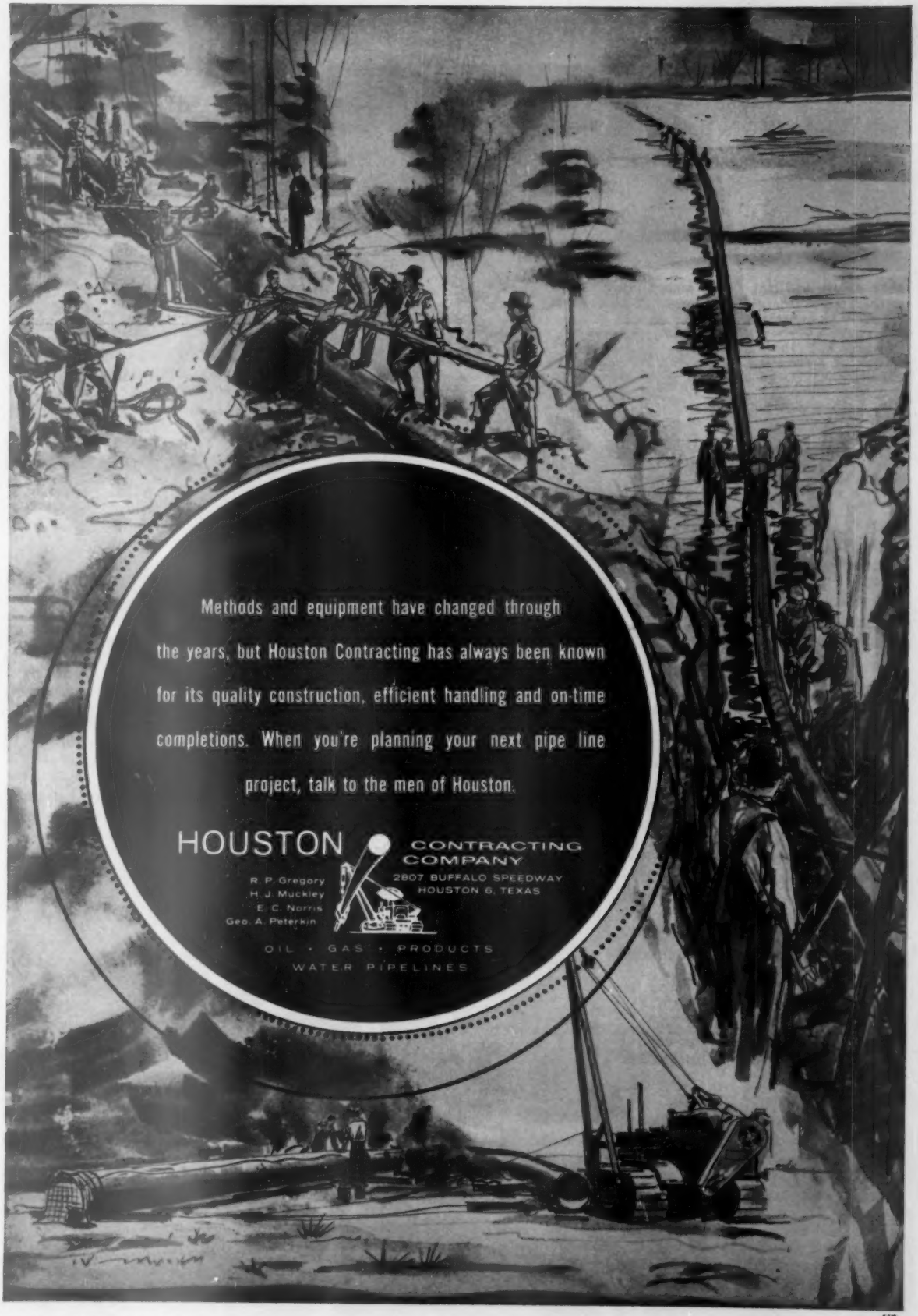
Compare **Thompson's field proved advantages and save money**

Automatic feed and mixer gives close control of dry muds and chemicals (except caustic soda) and mixer delivers mud to system thoroughly mixed. Actual field tests have proven an *increase in jel yield of 15% to 30%* over hand feed and jet mixing methods. Thompson Mud and Chemical Mixer is a complete unit with pump and power.



SOLD ONLY THROUGH SUPPLY STORES

THOMPSON TOOL COMPANY
Iowa Park, Texas


Methods and equipment have changed through the years, but Houston Contracting has always been known for its quality construction, efficient handling and on-time completions. When you're planning your next pipe line project, talk to the men of Houston.
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WATER PIPELINES

Equipment Men Notes

ATTENDING ANNUAL SALES MEETING of Byron Jackson Tools, Inc., at Houston recently were, from left, top row: I. B. Bryan, R. T. Todd, R. T. Harcus, A. R. Boyd, A. W. Rose (president of Byron Jackson Division of Borg-Warner Corp.), W. C. Brooks, V. J. Carter, W. F. Roberts, Jr., and O. J. File. In the bottom row, from left, are: A. E. Jordan, R. E. Leasure, J. F. Buckner, J. P. Kirby, H. C. Starr, P. A. Jordan, G. F. Nicolson, R. J. Evans, Jr., and J. S. Smith. Also present at the meeting but not pictured were: Dr. B. W. Gamson, V. W. Hillyard, R. G. Taylor, Jr., and John Ramsey.

NEW DALLAS HOME OFFICE and laboratory facilities of Core Laboratories, Inc., international petroleum-reservoir-engineering firm, were visited recently by some 500 members of the petroleum industry and civic and government leaders at an open house. The two-story, 40,000-sq.-ft. building is located on a four-acre site.

Minneapolis-Honeywell plans

. . . production of a new electrochemical system for controlling corrosion, according to the company's Rubicon Division. Production is slated to take place the first quarter of 1961.

The system, based on anodic passivation, was developed by research scientists of Continental Oil Co. It's being manufactured and marketed by Honeywell under an exclusive worldwide license.

J. H. Hagen, general manager of the Philadelphia-based Rubicon Division, said the system, called Anotrol, will be offered initially for control of corrosion in sulfuric acid storage.

Tube Turns Division sets up

. . . a nine-region field organization to strengthen nationwide marketing capabilities, announces John G. Seiler, president of the Chemetron Corp. division. Headquarter cities and newly promoted regional managers are:

Atlantic region, New York, S. M. Hardison, formerly Philadelphia district manager; north-central region, Pittsburgh, Herbert P. Smith, formerly Pittsburgh district manager; northern region, Chicago, J. C. Ellsworth, formerly Chicago district manager; southeastern region, Atlanta, James F. Craig, Jr., formerly Atlanta district manager; central region, Louisville, E. R. Muir, Jr., formerly Louisville district manager; midwestern region, Kansas City, L. D. Hall, formerly assistant manager, western sales; Mid-Continent region, Tulsa, L. O. Morris, Jr., formerly Tulsa district manager; southwestern region, Houston, W. B. Whenthoff, formerly district manager in Houston; and Pacific region, Los Angeles, N. P. Bosemer, formerly Los Angeles district manager.

Kaiser Steel Corp. appoints

. . . Thomas H. Wakeman and Jack H. Webber to management positions in the corporation's sales division, reports C. L. Emerson, vice president in charge of sales. Wakeman has been named manager of plate, structural, and bar sales, and will be located at the company's general sales offices in Oakland, Calif. Webber has been promoted to fill Wakeman's previous position as Mid-Continent district sales manager locating in Tulsa.

T. H. Wakeman

J. H. Webber

Wakeman joined the sales division in 1950, serving as assistant to the

INTERNATIONAL GUESTS at the recent meeting of the Los Angeles Chapter of Nomads are, from left, front row: Siegfried Thomas, of DEA, from Germany; Herbert Zweifler, of Preussag, Germany; Fred Peveto, of Camdrill, Libya; Jess Matheson, of Santa Fe Drilling, Africa; J. E. Bacot, of Q.P.C., Trucal Coast; and Guy Goldsmith, Aramco, Saudi Arabia. In the middle row are: Heinz Lettner, DEA, Germany; Achim W. Weide, Fagro, Germany; Fred L. Watkins, Arrow Drilling, Iraq; C. B. Welch, Santa Fe Drilling, Trinidad; Ray Conger, ex-Brown Drilling Co., Guatemala; and D. S. Campbell, Santa Fe Drilling, from Iraq to Chile. In the back row are: H. P. Downey, Arrow Drilling, to Iraq; H. E. Schumacher, Camdrill, Libya; Elmer Jones, C.S.V., Venezuela; G. T. Graves, Arrow Drilling, to Iraq; Nomad Connie Ridgeway, Macridge, Lebanon; and Herbie Berk, Petrobras, Brazil.

manager of tubular sales at Oakland before moving to the Houston office in 1952 as sales representative. In 1954 he became Mid-Continent sales manager.

Webber joined Kaiser's sales organization in 1945 at Oakland, moving to assistant general service manager in 1947. He was named sales representative at Tulsa in 1950.

Robert W. Johnson named V.P.

. . . in charge of marketing and sales for Graver Tank & Mfg. Co., division of Union Tank Car Co. He will be located in East Chicago, Ind., at Graver Tank's headquarters.

Johnson most recently was with Dunbar Kapple, Inc., of Batavia, Ill., as vice president and general sales manager. Prior to 1956 he was a marketing associate with Booz, Allen & Hamilton, a national consulting firm. His experience also includes a sales management position with Borg-Warner Corp.

Ben F. Kelley Co. appoints two

. . . sales - service representatives for KelCo safety products—Paul Little, in the Michigan area with headquarters at Jonesville; and Ray O. Carlisle, in the Four Corners area with headquarters at Farmington, N. M.

Before joining Kelley, Little was with Brown Oil Tools in Michigan. He has worked for Phillips Petroleum Co. and drilled on their rigs in Mid-Continent and Alaska fields. Little now operates a well-servicing and pipe-inspection company at Jonesville.

For the past 10 years, Carlisle has been with Mid-Continent Supply Co.

MODERN SUPPLY STORE of Jones & Laughlin Supply Division in Borger, Tex., is the division's display building from the 1959 International Petroleum Exposition held in Tulsa. The truss-type, sectional-steel building was dismantled at the oil-show grounds. A new sectional - steel addition was purchased from Allied Steel Products Corp., of Tulsa, and added to the rear portion of the original building during erection at Borger. The building provides more than 7,800 sq. ft. of floor space.

LESS FLUID SLIPPAGE!
LESS DOWNTIME!
GREATER EFFICIENCY!

Darcova Pumcup

Darcova 45° Bevel Type Pumcup

. . . in hydraulic and pneumatic mechanisms, reciprocating pumps

THE BIG DIFFERENCE you'll find in Darcova Pumcups is that they operate at full efficiency *throughout their entire life.* This means fluid slippage is virtually eliminated.

And because fewer replacements are necessary, you have less downtime. Users report that Pumcups *outlast ordinary packings at least 3 to 1!*

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where the PAY-OFF is on RELIABILITY!

Climax and Gardner-Denver combination—central Texas.

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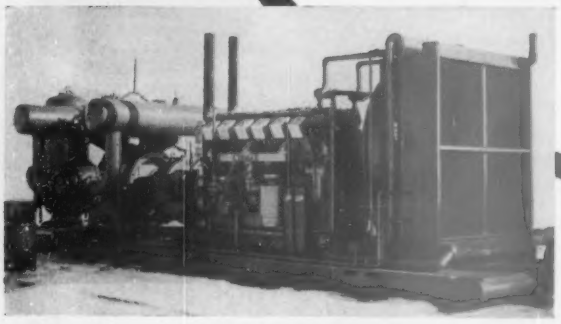
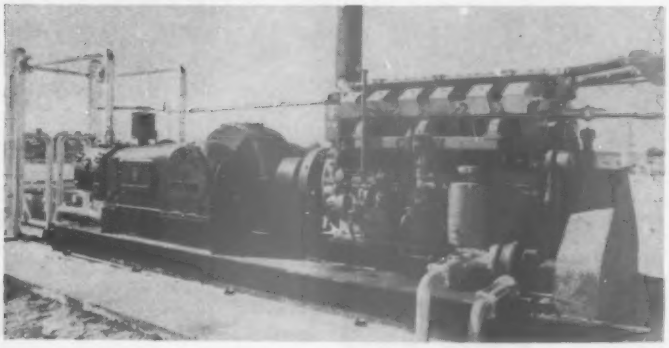


Climax V-125 driving a Joy compressor in Colorado.

In all the oil fields...



300 hp Climax and Oil Well Supply compressor in southern Texas.

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CL-105

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FACTORY—CLINTON, IOWA

and was Farmington store manager when he resigned this year to open his own business, Carlisle Specialty Co. He will cover New Mexico, Utah, Colorado, and Arizona.

Camco buys Plunger Lift Div.

. . . of National Supply Co., announces Harold E. McGowen, president of Camco, Inc., Houston oil-tool manufacturer. Plunger lift equipment will now be available from all Camco sales outlets, both domestic and export. Camco personnel will, for a 3-year period, service installations now owned or in use by customers who obtained the equipment from National Supply.

L. W. White appointed manager

. . . of Canadian operations for Otis Pressure Control, Inc., a division of Otis Engineering Corp., of Dallas. He will headquarter in Otis' Calgary office. White joined Otis in 1952 and in 1957 was appointed regional service superintendent in Calgary. He was named division manager in 1959, the position he held until his recent appointment.

Roger C. Clark takes over

. . . as sales representative for Western Supply Co., according to Earl Coulter, vice president of the Tulsa firm, who noted Clark would work out of the Tulsa office to service the entire state. Clark previously was a field engineer for Baroid and a sales representative for United Mud Service in Tulsa.

L. F. A. Mitchell is named v.p.

. . . in charge of sales of Vitro Engineering Co., according to D. M. Checkley, president. For the past 8 years, Mitchell has been vice president and director of Burns & Roe, Inc.

Mitchell was previously general sales manager of Sperry Products, Inc., and division manager, apparatus group, for Canadian Westinghouse Co. in Hamilton, Ont. He joined Westinghouse in 1934 and was transferred to the Canadian division 10 years later.

J&L Supply Division makes

. . . new assignments within its sales organization, according to W. L. Wolfe, vice president—sales. Involved in the changes are: J. L. Leimbrook, salesman at Farmington, N. M., transferred to Houston; T. D. Gholson,

New giant fire-killers!

Illustrated: 400 pound pressurized dry chemical

200 and 400 POUND DRY CHEMICALS FROM KIDDE!

Now – kill more fire – faster – with these new, giant, pressurized dry chemical extinguishers from Kidde! Ideally suited for fighting chemical, oil, gas and electrical fires, these new Kidde units pack an extra fire-killing punch, give you maximum protection in a minimum package.

Like all Kidde fire extinguishing equipment, these new dry chemicals give sure, dependable performance, feature fast, easy operation even with inexperienced personnel. Check the many features that these new Kidde units offer . . . then check the fire hazards in your own plant. Chances are you need a lot more fire protection. It's a good idea to make it *Kidde!*

For additional information on these and other Kidde fire extinguishers and systems, write to Kidde today.

- Easy-to-read dustproof and moisture-proof pressure gauge tells at a glance if unit is ready for operation.
- Exclusive Bridgeman Seal gives a three-ton locking pressure on head of unit to make it leakproof and tamper-proof.
- Simple, fast operation lets you get the jump on any fire. The units give you shut-off valve control at the nozzle too.
- Special Kidde universal nozzle gives long-range discharge pattern without any turbulence. 40′ discharge range.
- Both 200 and 400 pound units can be installed either free-standing or wall-mounted. 50′ or 100′ of hose.
- Underwriters' Laboratories-approved.

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"This Leland 'Packaged Unit'

gets the job done"

Winching a heavy motor or handling a tough towing job is all in a day's work with the Leland "Packaged Unit." On all types of heavy-duty trucking jobs—over the roughest terrain—the "Packaged Unit" has a proven record of consistent performance the world over.

Five exclusive features have made the Leland "Packaged Unit" a leader in its field . . .

- Headache Rack
- Winch Mounting Brackets
- Rolling Tail Pipe
- Gin Pole Pocket Settings
- Flush Mounted Body Deck Plate

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FOR EVERY TRUCKING NEED

Ask about Leland Pipe Trailers, Self-Loading Floats, and Fifth Wheel Bodies . . . dependable performers in the heavy-duty trucking field. The "Packaged Unit" is also available for mounting on 1-ton trucks.

Leland is your **best bet** for parts and service on these famous lines . . . Thew-Lorain . . . Gardner-Denver . . . C-M-C . . . Blaw Knox . . . Cedarapids . . . Cleveland Trenchers . . . Tulsa Winches

For full details on the complete line of Leland equipment, contact: Leland Equipment Company, 408 No. Main, Tulsa, Oklahoma, or call or write any of the offices listed below.

35th Anniversary 1925-60

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previously at Houston, now resident salesman at Jackson, Miss.; D. T. Henderson, shifted from Shreveport to Monroe, La., as a resident salesman; Haney Atyia, salesman at Midland, Tex., now assigned as field salesman there; J. B. Williams, appointed resident salesman at El Dorado, Ark.; and James A. Bailey, appointed regional salesman—production equipment at Midland.

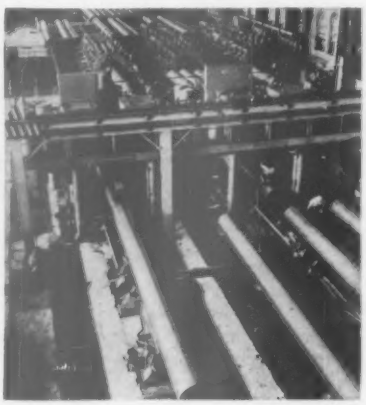
R. B. Hazard is elected director

. . . of Raybestos-Manhattan, Inc. Hazard, vice president and sales manager of rubber and packings, the post he has held for 4 years, started with Raybestos-Manhattan in 1945 as sales representative at Minneapolis.

In 1948 he was appointed manager of distributor sales in the western district at Chicago. In 1952 he became sales manager of the Packing Division at Manheim, Pa., and in 1955 was named sales manager of the Rubber & Packing Divisions at Passaic, N. J.

Daniel Orifice Fitting Co. names

. . . Chipley & Jensen, Inc., of Milwaukee, as exclusive sales representative in the Milwaukee area. The sales territory encompasses all but the western portion of Wisconsin and reaches north to include the upper peninsula of Michigan.



NEW LINE-PIPE Mill of Bethlehem Steel Co., at Steelton, Pa., produces high-strength, large-diameter steel pipe for cross-country transmission of high-pressure natural gas. About 25,000 tons of line pipe (18 to 42-in. o.d.) can be produced each month. Above, far background, cans are moved longitudinally by conveyors, then by gravity skid until they roll into the lead end of one of three cylinder-type inside seam welders. Each can is welded on the inside first and closed much like a zipper, at a rate of 50 to 75 in. per minute. Then the outside seam welders (foreground), by tandem submerged electric arc welding, deposit a continuous weld at a rate of 50 to 75 in. per minute. Bead is continuous from can to can.

Plane, Train or Limousine?

(none of these, this is a helicopter!)

Looks like a conference room, doesn't it? Well, it is in a way. The cabin of this new turbine-powered Sikorsky S-62 was designed by Raymond Loewy to make every trip conducive to meetings, study, work and even rest.

The turbine engine not only contributes to this atmosphere with its smooth, quiet operation but also has an unequalled record of reliability to recommend it. And because the mechanical components of the S-62 have been proven in over 1,000,000 hours of flight, periods between overhauls are four to five times longer than would normally be expected of new components.

This nine-passenger, boat-hulled Sikorsky S-62 is the newest addition to the family of helicopters you so often see in the news transporting government dignitaries both here and abroad. As it does for them, a Sikorsky helicopter will cut your executives' traveling time considerably.

So today, jot a note to Sikorsky Aircraft on your letterhead and a representative will call to show how your company can gain in *business*, in *time*, in executive *power* and in *prestige* with a new Sikorsky S-62 executive helicopter.

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Greater "Clinging" Power for Increased Thread Protection!

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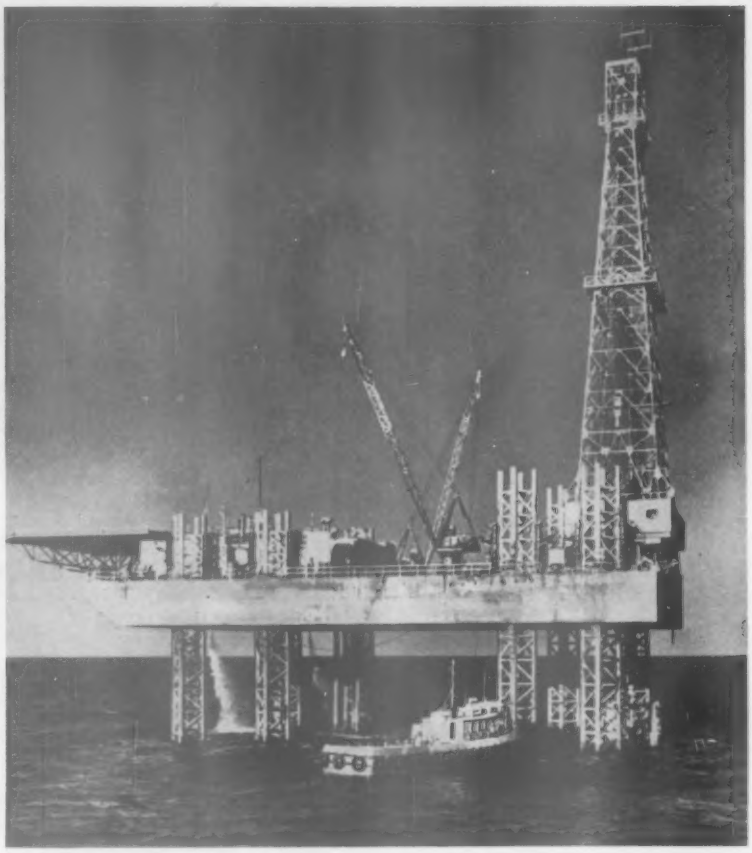

TWO RIGS like this DeLong Corp. platform swell Offshore Co.'s total number of water units to 23.

Two rigs join offshore drilling

TWO MORE deep-water offshore drilling platforms have been purchased by Offshore Co., Baton Rouge, from DeLong Corp. of New York.

The firm now owns and operates 5 DeLong platforms in addition to 18 other units which consist of self-contained platform rigs, tender-type rigs, submersible units, and floating drills. It also has inland water barges and land rigs.

The acquisition of this new equipment makes Offshore the owner and operator of the largest fleet of deep-water mobile drilling units in the world. The firm which specializes in water drilling, from 10 to 200 ft. deep, during the past quarter-century has used six basic types of rigs for water drilling and has worked in offshore areas of the United States, Panama, Trinidad, and the Persian Gulf.

Metal propping agent is tried on West Coast

ALUMINUM-ALLOY PELLETS, buckshot size, tried as a propping agent in a California well, appear to have given encouraging results. The well in which the experiment was conducted was the most easterly well of Reserve Oil & Gas Co. in the North Tejon field, Kern County.

Reserve first tried injecting walnut hulls through two notches in the 312-21 RWB well. The bottom slot took 3,900 lb. of hulls at 12,152 ft. and the top notch received 1,100 lb. at 12,120 ft. The 12,251-ft. well was completed for 40 bbl. a day of fluid, with 21 bbl. of oil daily.

A rig was moved in to clean out to bottom and two more notches were

cut at 12,180 and 12,142-ft. levels. The two zones were fractured and the propping agent on the bottom was 2,000 lb. of 8 to 12-mesh aluminum-alloy pellets. In the upper notch, 1,200 lb. of pellets were used at 12,142 ft.

The well was returned to production on November 7 and it immediately produced a large amount of salt water which was the carrying agent. First oil appeared on November 11. On gas lift the well made 295 bbl. daily of fluid with 15 bbl. of oil. After 5 days the ratio of oil jumped to 182 bbl. net daily out of 350 bbl. per day gross. Gravity of the oil varies from 31.9° to 33.3°.

Small-pipe string set on West Coast

SOMETHING NEW in West Coast completions was tried by Humble Oil & Refining Co. at one of its wells in the Castaic Junction field. At the 68 Newhall Land & Farming well, northwesternmost in the pool, a double string of tubing was run as casing. Two strings of 2⅞-in. tubing were cemented at 13,289 ft. and at 13,316 ft., respectively.

Completions of this type, which are common in the Mid-Continent and Gulf Coast areas, are seldom used in western producing areas. A few single strings of tubing without casing have been run but this is the first double-string small-pipe completion, using tubing as pipe.

With the two strings resting side by side in the hole, a perforating problem is posed. When one of the strings is shot, a possibility of unintentionally perforating the other exists. Humble wanted to shoot a thin interval just below 12,900 ft. for a deferred water shutoff. The job was accomplished successfully by use of an oriented device provided by Go-Oilwell Service, Inc., of Fort Worth.

Florida offshore area to be tested

AN OFFSHORE FLORIDA block will be tested by a deep probe with the lower Tuscaloosa sands as the target. General Exploration Co. of California acquired a 10% interest in an overriding royalty on a 875,920-acre block, one of the largest tracts ever dealt for in the Gulf Coast.

Roger Williams Development Co., Providence, R. I., has farmed out the property to Jett Drilling Co. of Shreveport, La. The latter will drill a 12,000-ft. test to the Rodessa and Sligo sands.

Combine your Couplings, Welding Fittings, Flanges, Swage Nipples and Bull Plugs, Pup Joints, Sub Nipples, Sub Couplings, Weld Reducers, Caps and Saddles on one purchase order and take advantage of prepaid freight or freight allowance. Freight prepaid on combined shipments of 500 lbs. or more of the above items to one destination.

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Stand lifts, holds, tilts 55 gal. barrels. Prevents spillage—easily loaded.

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ANOTHER MAJOR BREAKTHROUGH FROM DOWELL

FLAC

A new kind of Fluid Loss Additive for Cement that far surpasses anything previously offered

WHAT IT IS. FLAC* is an important new fluid loss control additive for Class A and E neat and Class A bentonite oil well cement systems. Technically, it is a high-molecular-weight, synthetic polymer. It is supplied in the form of a dry powder that is easily mixed into either cement or water.

ADVANTAGES include reliable squeezing or primary cementing—especially in porous, high temperature zones. FLAC is especially useful for permanent type and tubingless completions. Since excess cement can be reversed out before testing, this saves a round trip as well as expensive drilling-out. WOC time is held to a minimum.

WHAT IT DOES. When used in correct concentrations, FLAC drastically reduces fluid loss of the cement slurry over a wide temperature range and at high differential pressures. It is stable at both high and low temperatures and does not affect slurry and set cement adversely. Premature dehydration is prevented and the result is reliable thickening time in squeeze cementing and maximum fill-up in casing cementing.

To give some idea of just how efficiently FLAC reduces fluid loss, here are some representative figures taken from laboratory tests made under simulated well conditions.

These tests were conducted according to API procedures set forth in RP-10B, January, 1960. Slurry was first subjected to appropriate API test schedule in the pressure thickening-time tester. The time interval was equal to that required for slurry placement in a well. Then fluid loss tests were made on the slurry samples in a high-temperature, high-pressure tester. API cement filter screens were used at maximum cementing temperature and at 1,000 psi differential pressure.

Class of Cement	Percent Bentonite	Percent FLAC	Temperature (Degrees F)	API Thickening Time—Hours and Minutes	Fluid Loss at 1000 PSI cc/30 Minutes
A	0	0	113	2:30	800
A	0	1½	113	2:28	35
A	12	0	125	2:30	336
A	12	1½	125	2:40	34
E	0	0	213	1:40	1000
E	0	1	213	2:15	100
E	0	1½	213	2:50	50

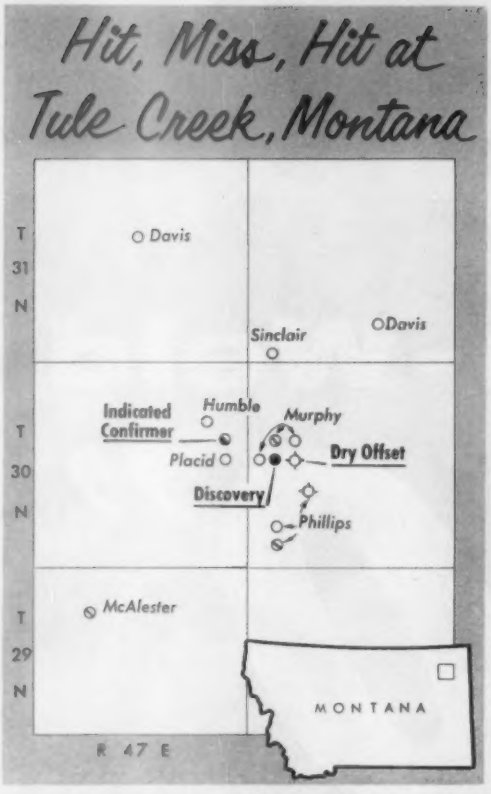
FOR MORE INFORMATION on FLAC, contact the nearest Dowell representative. Dowell services and products are offered from more than 150 offices and stations in the United States, Canada, Venezuela, Argentina, France, Germany and the Sahara area. Dowell, Tulsa 1, Oklahoma.

* Dowell Trademark

Services for the oil industry

DOWELL

DIVISION OF THE DOW CHEMICAL COMPANY



IF RUMORS PROVE TRUE, Tule Creek field, Roosevelt County, Montana, has its second oil well 1½ miles west of the 1 Sletvold discovery. Second test of the field was dry, ½ mile east of the original strike.

Tule Creek play moves west, after failure to east

BY FRANK J. GARDNER

WIDELY HAILED as the discovery of the year in the Williston basin, the Tule Creek strike in Roosevelt County, Montana, has provided more grist for the rumor mills than any other discovery in recent months.

Hot or cold . . . Following the completion of Murphy Corp. 1 Sletvold on October 31, a brisk lease play swept across the entire northeast corner of Montana. In less than 2 weeks, 14 new wells were announced. Geophysical crews were rushed into the area. Overnight, Tule Creek was the "hottest spot in the Rockies."

Then the bomb fell. Murphy's first offset, the 1 Zimmerman (Section 17-30n-48e), was dry. Lying only ½ mile east of the Sletvold, this first failure went to total depth 7,775 ft., no other data were released . . . like other tests now drilling in the field, it was tight.

Today, Tule Creek steams again, as rumors fly concerning Placid Oil Co.'s 1 Lough, 1½ miles west of the discovery. This test, in Section 13-30n-47e, reportedly has flowed oil on drill-stem test of the Nisku-Devonian above total depth of 7,730 ft. At last report, Placid had run logs at the well, and the outcome will be known shortly.

Persistence pays off . . . Murphy's 1 Sletvold discovery was finished for 476 bbl. of 42° oil from Nisku perforations at 7,660-76 and 7,686-92 ft.; the flow was through a 14/64-in. choke. It lies in Section 18-30n-48e. Much geological and geophysical work preceded its spudding last September.

Phillips Petroleum Co. had drilled a dry hole, the 1-A Sethre, in Section 20 to 9,386 ft. in 1957. Following the abandonment, Murphy and Placid joined forces and reshot the area with seismograph. They had a tough time interesting nearby leaseholders in a new wildcat, and finally went the farmout route to drill the 1 Sletvold. It was 35 miles southwest of the nearest Devonian production at Redstone field in Sheridan County, and its success has thrust the Devonian into new prominence in the Williston country. With the exception of North Dakota's Beaver Lodge field, this formation has yielded nothing but one-well fields; this may explain why Tule Creek operators shuddered at the failure of Murphy's first offset.

And new wells go down . . . Now, with success hinted at the Placid well to the west, the field's course achieves some kind of orientation. Most of the new wells, drilling or planned, lie west of the discovery.

To the west, Humble Oil & Refining Co. will drill its 1 Isachsen in Section 11-30n-47e; it's an 8,000-ft. test aimed at the Nisku. Placid's 1 Lough, the rumored new oiler, lies 1 mile to the southeast. Another Placid test, the 2 Lough, is in Section 13, a south offset.

Seven miles west and south of the center of Tule Creek, McAlester Fuel Co. is sinking the 1 Toavs "A" in Section 8-29n-47e to the Duperow-Devonian. While it is hardly a "field well", it could shed some interesting light on the position of the Nisku in that direction.

South of the discovery well, Phillips has two wildcats on the docket. The 1 Davey "A", not yet spudded, will go down in Section 30-30n-48e, and the 1 Spencer "A" is approaching 7,900-ft. contract depth in Section 31.

North of the field, Sinclair Oil & Gas Co. has located the 1 Stai in Section 31-31n-48e; this will be an 8,000-ft. Duperow test. In the same township, Davis Oil Co. will drill the 1 Rush in Section 27. Davis' second location in the area is the 1 Stensland, Section 16-31n-47e; this one lies 8 miles northwest of the field.

At the Tule Creek nucleus, meanwhile, Murphy has two new locations and one drilling well.

That's a lot of activity to be generated by a single oil well. But there's a reason. The leases in this region were inked in 1950 and 1951 during the Williston basin fever period; now they're on the verge of expiration. Too, there are Indian lands involved, and a sale of these is due early next year. All this adds up to drilling action . . . and soon.

Announcing.....

Jal-Con-Weld

"50"

Macaroni Tubing

Made from Jones & Laughlin continuous weld steel tubing with a yield strength of 50,000 psi. Price and performance data now ready from Jones & Laughlin Supply Division, Drawer 2481, Tulsa 2, Oklahoma.

You'll be surprised at the low price and the high performance.

Jones & Laughlin

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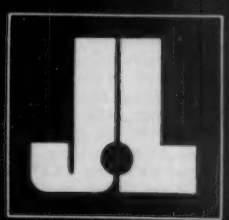
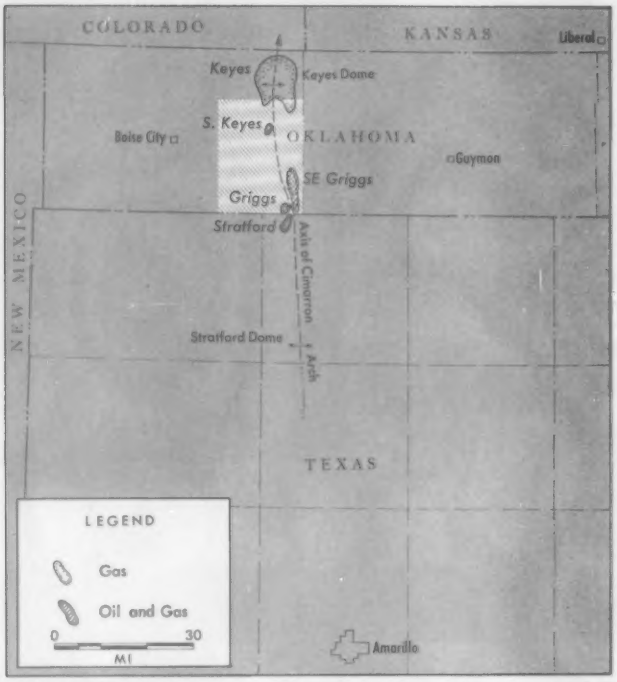


If 17 pay zones above 5,000 ft. are an inviting prospect . . .

Better double check the Cimarron



CIMARRON ARCH straddles the Texas and Oklahoma panhandles and extends into southern Colorado. Several fields, both gas, and oil and gas, are associated with this feature.

HOW MANY PAY ZONES above 5,000 ft. are needed before a drilling prospect is inviting? Are 17 enough?

If so, take a look at eastern Cimarron County, Oklahoma. Here, wells produce in 1 or more of 17 separate pays. Every new start offers the possibility of making it 18. If that eighteenth one is from one of the well-developed Tubb-Red Cave sands, southeast Cimarron County will become the fastest-moving exploratory area in the Hugoton-Panhandle area.

The Cimarron arch is a broad, north-south-trending uplift which begins in southern Sherman County, Texas, crosses the Oklahoma Panhandle in eastern Cimarron County, and plunges into the Southeast Colorado portion of the Hugoton embayment near the Oklahoma-Colorado line.

The uplift of the arch started during Mississippian time; it was a positive feature undergoing erosion at the end of Mississippian time. It received its greatest uplift in early Pennsylvanian time, but was rejuvenated

BY CHARLES A. SHAW
Gryphon Oil & Gas Co.
Amarillo, Tex.

throughout the Pennsylvanian and Permian, and probably saw movement as late as Mesozoic time. Steep dip indicates faulting along the west side of Southeast Griggs pool, and possible fracture lineaments have been observed on aerial photographs in 3n-8e, C.M. Generally, however, the arch is devoid of faulting.

The principal producing horizons are the sands of the Morrow-Pennsylvanian formation, and the thickest and most prolific producing sand is the basal, or Keyes sandstone. This sand does not offer the possibility of a good reservoir in the area of steep dip in the southeast portion of Cimarron County. Here, when present, the Keyes is not well developed. Generally, the upper sands are better developed than other Morrow sands, but on the arch they have been found productive only in Southeast Griggs field and on the north flank of Keyes field.

The formations of Atoka, Cherokee, and Marmaton groups, and the Missouri and Virgil series are essentially limestone, interfingered with granite washes and arkosic sands. Production is found in both the sandstone and limestone facies of these formations. Immediately above the lower Wolfcamp limestones begins a succession of sands and shales. The sands of Winfield, Krider, and Wichita ages are producing in Griggs field and are correlative to the limestone reservoirs of Panhandle and Hugoton fields. Above the Wichita and below the Cimarron anhydrite are the sands and shales of the Red Cave-Tubb sequence.

In mid-November, the first Tubb-Red Cave well in Oklahoma was completed for 4.2 M.M.c.f.d. through 2⅞-in. casing at 1,707-11 and 1,723-31 ft. The well, located in SW SW SW 29-1n-9e, Cimarron Meridian, Cimarron County in the Panhandle, had gas with low B.t.u. content and high helium content. Pay was encountered just below the Cimarron anhydrite marker.

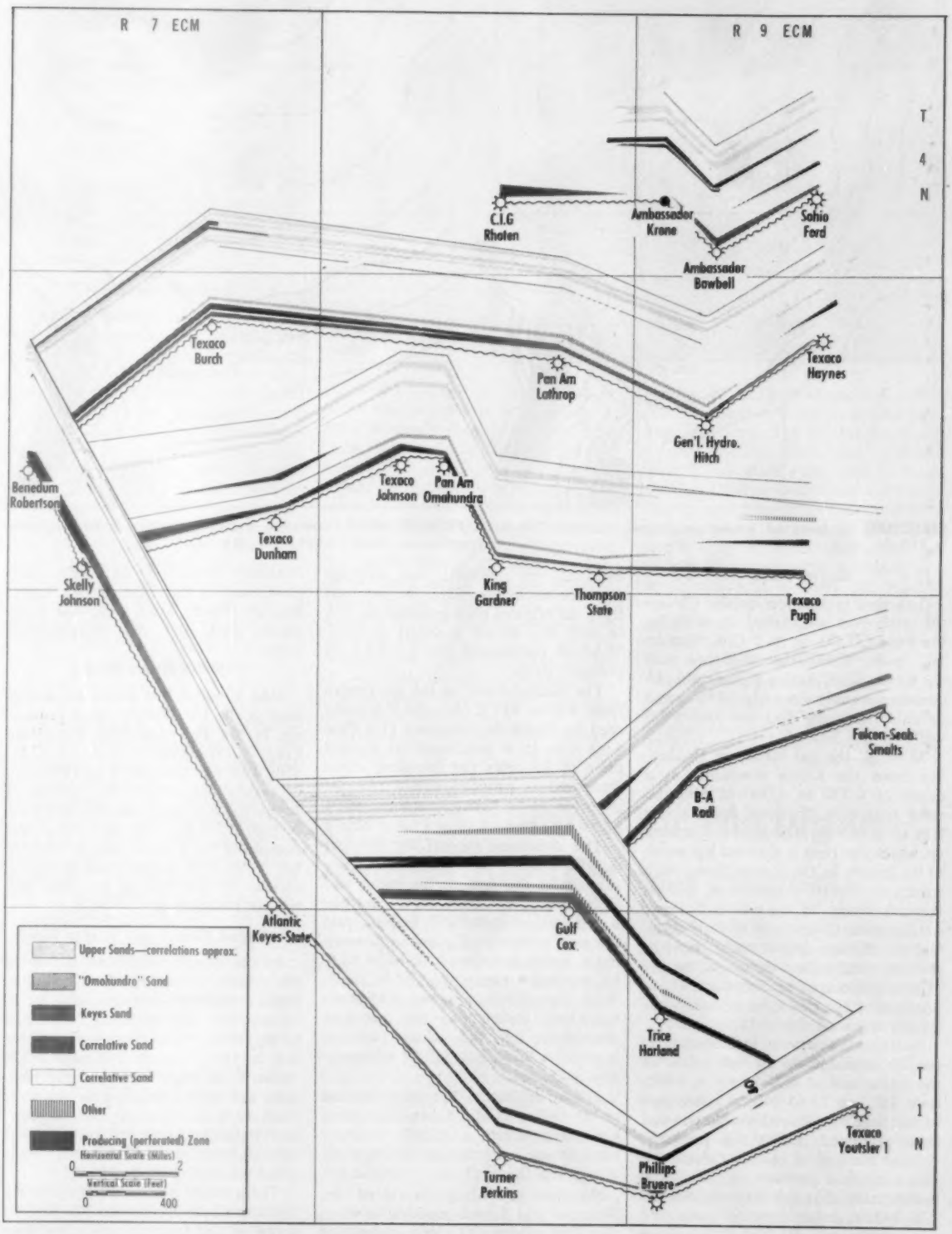
About the Author . . .

Charles A. Shaw graduated from the University of Oklahoma in 1941 with a BS degree in geology. He also undertook graduate work in business management at the University of Houston.

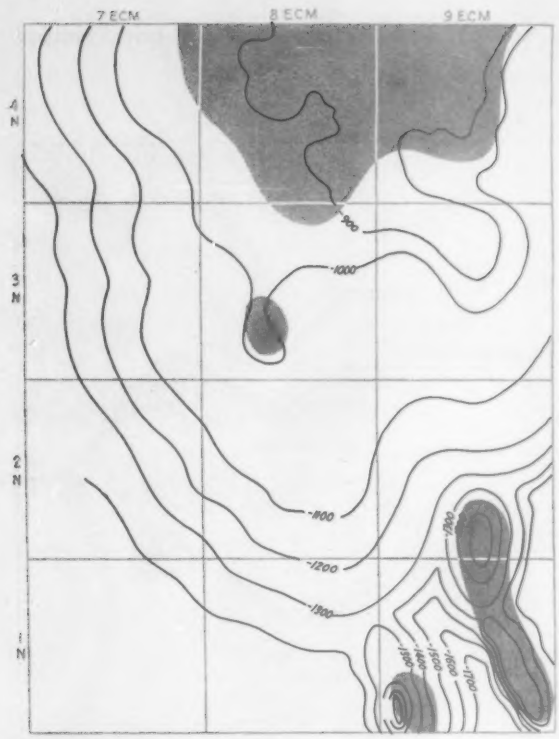
Until 1950, he worked with Sun Oil Co. and Forest Oil Corp. He was a consultant at Midland until 1954. He was a senior geologist with the Union Oil & Gas Corp. of Louisiana (now Union Texas Natural Gas Corp.) from 1954 to 1957, supervising exploration in West Texas, the Rocky Mountain area, and Canada.

Since 1957, Shaw has been consulting and engaged as an independent operator in Amarillo, Tex. He has done extensive work in the Texas and Oklahoma panhandles, southeastern Colorado, and southwestern Kansas.

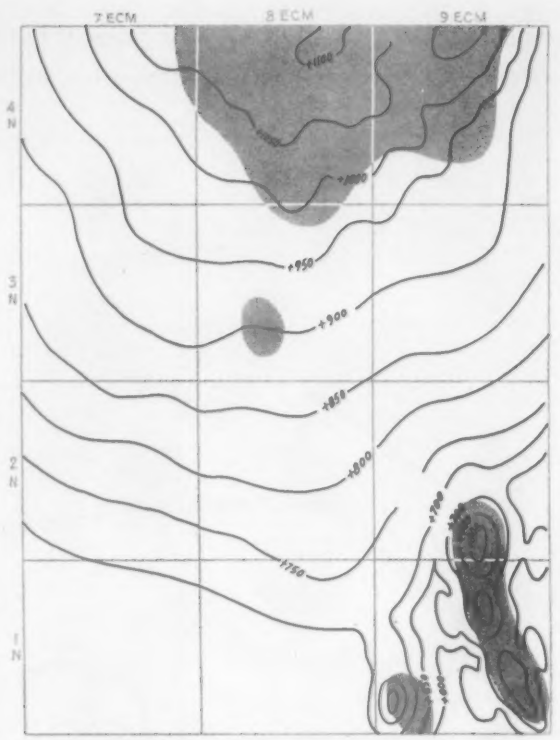
Another Golden Trend? This author suggests drillers look at these factors—numerous pays, shallow depths, and reservoirs that vary from a few feet to over 100 ft.



MULTIPLICITY of targets above 5,000 ft. is readily seen in this panel diagram.



STRUCTURE at base of Keyes sandstone. Contour interval is 100 ft.



PERMIAN-NEVA formation shows generally same configuration as deeper beds with less relief.

Keyes Field

The first production on the Cimarron arch was established in 1943 by the Pure Oil Co. in its 1 Cox, Section 16, 5n-8e, C.M., the discovery well for Keyes field. Active drilling did not commence until the early 1950's, and to date there are 160 gas and 9 oil wells in the field.

Most all the gas wells are producing from the Keyes sandstone at a depth of 4,700 to 4,900 ft. and the sand ranges in thickness from a few feet to 100+ ft. The positive feature on which the field is situated has come to be known as the Keyes dome, with structural closure in excess of 200 ft. Isopach maps of sand indicate a southeast-northwest axis of deposition, and the thicker deposits are found in the sinks and valleys developed on the Mississippian erosional surface. Oil is produced from this sand in four wells on the flank of the field.

Sufficient reservoir information is readily available on all but a few of the wells, and as of January 1, 1960, only 9%, or 72.65 billion cubic feet of the field's total recoverable gas had been produced. Using the pressure-volume method of reserve calculation and a residual pressure of 100 lb., it is estimated that the Keyes sand has 736 billion cubic feet of remaining recoverable gas. Each well has been on production an average of 53.32 months, and has produced 9.87 M.M.c.f. per month. The average pressure decline is 53.5 lb. per well from an original rock pressure of 775 to 825 lb., which is equal to 9.77 M.M.c.f. production per pound of pressure drop.

The heating value of the gas ranges from 800 to 825 B.t.u., and it is gathered by Colorado Interstate Gas Pipe Line Co. It is purchased at a base price of 16 cents per thousand cubic feet, and is proportionately reduced in price as to that percentage of 1 M. B.t.u. gas.

The depressed market for this gas is attributable to several factors—principally the lack of an outlet and Federal Power Commission controls. Keyes gas contains 2% helium, and the new government plant is processing a yearly average of 50 M.M.c.f.d. Its maximum capacity is 70 M.M.c.f. With Interstate's planned additional market outlet, and an increased throughput into the helium plant, it is possible that takes will be substantially increased.

While drilling a Mississippian test in 26-4n-9e, C.M., Sohio Petroleum Co. encountered a middle Morrow sand in its 1 Ford and subsequently completed the well for 1 M.M.c.f.d.

Another producing sand of the Morrow was found productive when the Ambassador Oil Corp. completed its 1 Krone, 19-4n-9e, C.M., for 168 BOPD to open Southwest Burton field now comprising four wells. Also producing in the field is one upper Morrow Purdy sand well, one Marmaton well, and two Mississippian wells.

South Keyes Field

One hundred feet above the Keyes sand is the Omohundro sand producing in the Pan American Petroleum Corp. 1 Omohundro, 21-3n-83, C.M. This well was completed in 1946, put on production in late 1952, and as of January 1 had produced 435 M.M.c.f. of high-B.t.u. gas. The west offset was completed by Texaco Inc. in December 1958 as a Keyes sand producer, and as of the first of the year was not on production.

Southeast Griggs and Griggs Fields

In the extreme southeast corner of the county, on an elongated, possibly faulted anticline revealing 400 ft. of closure, is the multipay Southeast Griggs field. It was discovered by Texaco in 1957 with its 1 Youtsler, 23-1n-9e, C.M. Eight different pay horizons are now producing in the field from 12 wells—6 dually completed—and indications are strongly positive that completion attempts could open other producing zones.

Three miles west is the Phillips Petroleum Co.'s shallow Griggs field of seven oil and four gas producers. Two of the wells are completed as oil producers in the Winfield at 2,600 ft.

and gas in the Massive lime (Wabaunsee) around 3,300 ft.; one is a dually completed oil well in the Krider and Winfield; two are producing in the Wichita at 2,400 ft.; two in the Winfield, and two singly completed Massive lime gas wells. Since its discovery in 1957, the field has produced 81,546 bbl. of oil, which is trucked to Phillips' refinery at Borger, Tex.

The gas wells in these fields are shut in waiting on connection to the Transwestern Pipe Line Co.'s system. Transwestern's customary contract calls for payment of 17 cents per M.c.f. of gas for the first 5 years, and upon FPC approval to be increased to 19.5 cents the next 4 years, and 26 cents thereafter.

Exploration Methods

Structural interpretation and study of facies changes is the normal exploratory tool used by operators in the area. However, the reflection seismograph has been successsfully used. Seaboard Oil Co. is reported to have uncovered some sharp features on the arch; and it is understood that all of Texaco's drilling is the result of seismic exploration. Texaco, together with acreage acquired through the Seaboard merger, holds approximately 40% of the leases in the area, and is also the most active driller operator. Other than Southeast Griggs, Texaco has drilled four wildcats, one of which (1 Haynes, 10-3n-9e, C.M.) is a Keyes sand producer.

Through aerial photographic interpretation, anomalous features can be detected.

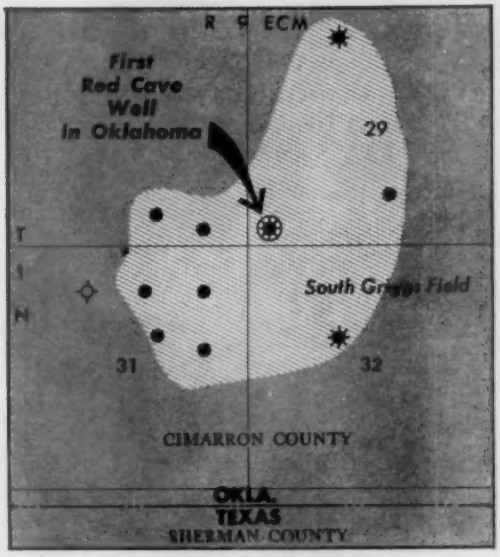
Areas of interest such as concentric and trellis drainage patterns, solution topography, tonal anomalies, and fracture lineaments can be discerned through the study of stereoscopic pairs of photographs. Known subsurface highs can be located and correlated to surface features. Conversely, interpreted surface features can be the guide to construction of credible subsurface contour maps.

Unlike the Hugoton embayment and parts of the Anadarko basin where stratigraphic studies are of first importance to the accumulation of hydrocarbons, structure is the prerequisite to accumulation on the Cimarron arch.

Subsurface structure maps indicate the broad, gently dipping character of the arch.

Drilling has revealed sharp, structural anomalies at Griggs and Southeast Griggs, so with careful and detailed mapping, coordinated with available exploratory tools, other similar structures should be uncovered.

Before the advent of extreme interest in the lucrative, quite shallow



FIRST Tubb-Red Cave well in Oklahoma was G. E. McBride 1 Godwin which had high helium content. Red Cave produces in Texas Panhandle to south.

(1,700-ft.) Tubb-Red Cave sands, interest was principally centered in the older Pennsylvanian formations, especially the sands of the Morrow formation. To define structures at this depth, subsurface structure mapping was confined to a datum near these horizons. To determine structures of the Morrow, primarily the basal sand, the author uses as a datum the base of this sand rather than the erosional surface of the Mississippian. To evaluate the shallow possibilities, not only the Tubb-Red Cave sands but also the sands of the Lower Permian, the top of the Neva formation is mapped.

Exploratory justice has not been done the Cimarron arch.

Several factors which have deterred exploration still exist. Much of the acreage is tightly held and subsurface control is sparse. Some deterrents have been overcome. The low-B.t.u. gas and a poor market have been replaced with 1,100 B.t.u. gas and a ready market. Drilling costs have been minimized and lost-circulation problems are practically nonexistent. The Cimarron arch, with its short-term expensive leases, shallow multipay potentialities, and a ready gas market may be another "Golden Trend" for Oklahoma.

Acknowledgments

The writer expresses his appreciation to Nolan R. Morse, district manager, Sohio Petroleum Co., for his cooperation. Thanks are also given to T. H. Tkyeson of Dwight's Oil & Gas Reports for providing material used to calculate the reserve figures.

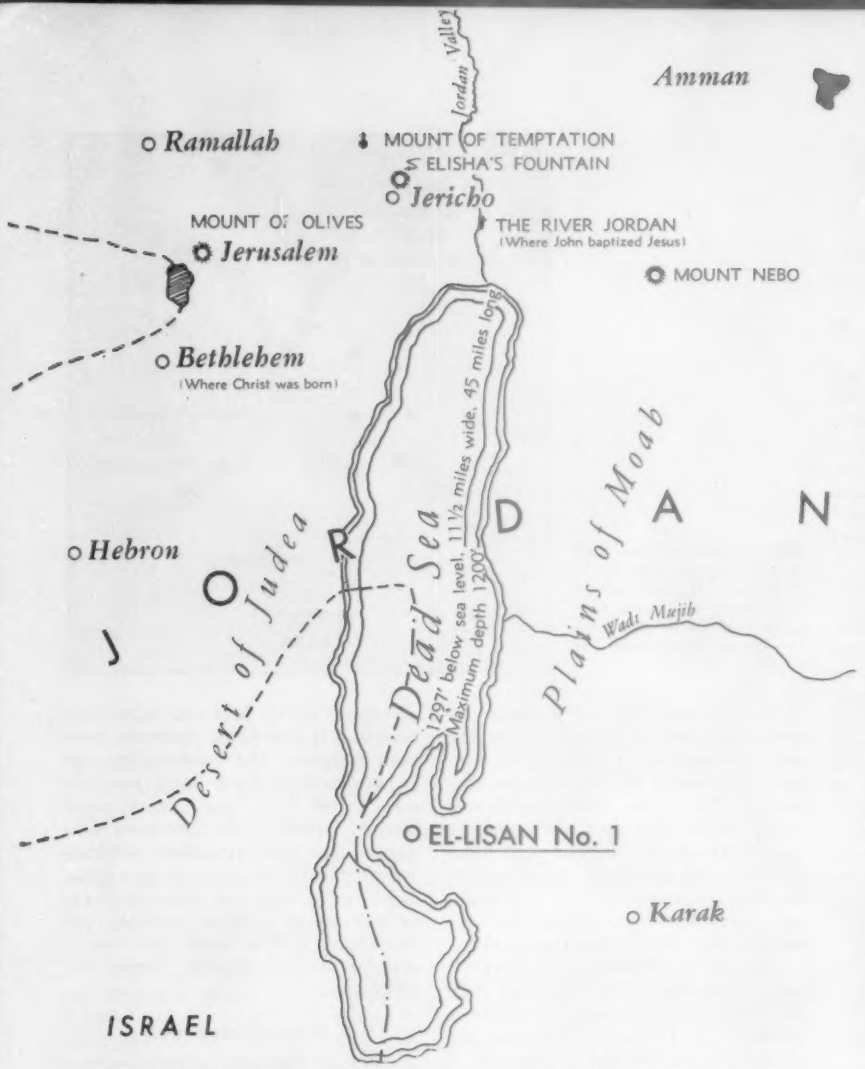
Record number of Michigan drilling permits are issued

Thirty-two drilling permits were approved by the Conservation Department for the current week, a 1960 record for oil and gas starts. In April, 42 permits were issued in a single week but 25 of these were for facility wells in gas-storage fields. Ten of the thirty-two permits called for wildcat tests in Allegan, Branch, Calhoun, Hillsdale, Lenawee, Newaygo, and Sanilac counties.

Whitehall Oil, Inc., New York City, received permits for five more Michigan wildcats, with three exploratory tests now drilling in Newaygo, Livingston, and Sanilac counties now. All are on Humble farmouts.

Collins and Black 1 Dancer, SW NW SE 29-3s-1w, Summit Township, Jackson County, was abandoned at 6,088 ft. after setting a 1960 "first." It was the deepest geologically drilled in Michigan this year, penetrating the Eau Clare sand and quartz zone of Precambrian time. Trenton beds were logged at 3,992 ft., Black River at 4,300 ft., Prairie du Chien 4,660 ft., and sand at 5,446 ft. No shows were recorded.

Drilled to 4,741 ft. with conventional rotary rig, it was carried from 4,741 to 6,088 ft. with a (Hycalog) hydraulic power swivel, using diamond bit on 2⅞-in. tubing for drill pipe, with unit working off conventional drilling machine. Bit was on bottom for 25 days cutting 1,400 ft. of hole before a trip was made.



HERE IS THE LOCATION OF EL LISAN 1, the last well drilled by Phillips Petroleum Co. in Jordan. The map shows the well's relation to Biblical areas of Jordan, a country created after World War I.

MUNIB MASRI, Jordanian geologist,

Jordan needs more wildcats

A LAND OF SCARCE WATER—Villagers from near by enjoy water from a Phillips supply well near drilling wildcat in Jordan.

ONLY two countries in the Middle East lack oil fields—Jordan and Lebanon. As the wave of prolific oil discoveries swept over the Middle East in recent years, these two nations have remained high and dry. Exploration in Jordan has not been lacking, however.

El Lisan. Phillips Petroleum Co. recently abandoned its sixth dry hole on its Jordan concession. The El Lisan 1, located on the El Lisan Peninsula near the south end of the Dead Sea, was bottomed below 14,000 ft. Phillips is now studying data collected from this wildcat before deciding on further work.

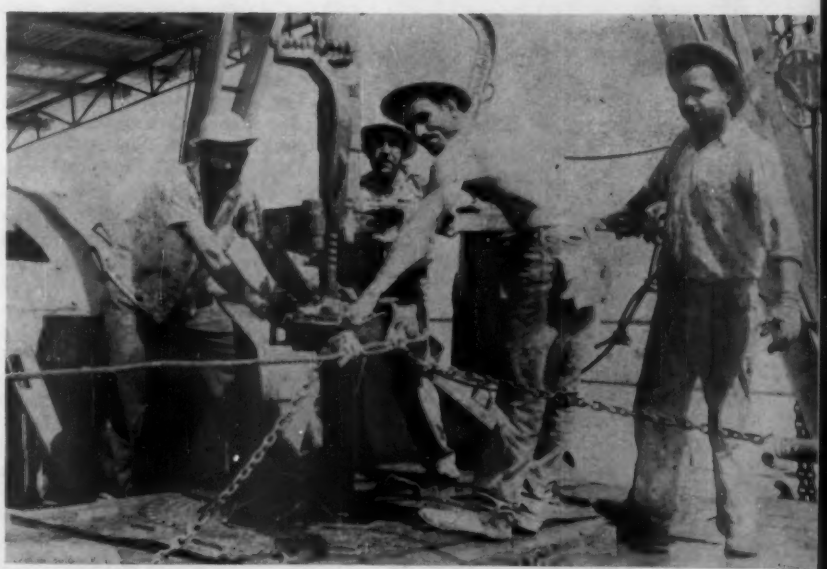
Phillips added about 435,500 acres to its concession in Jordan last year. This new acreage was adjacent to and south of the Dead Sea, and along

thanks a Bedouin shaikh for moving his camp site to make way for Phillips' drilling operations in Jordan.

the Israeli border. The additional acreage made a total of about 8,140,000 acres held under concession by the company in Jordan at the end of 1959. The company completed 4 party-months of geological survey and 4 party-months of structural core-drilling during that year. In addition, Phillips completed three wildcats—the Halhul 1 at 6,910 ft., the Suweileh 1 at 7,639 ft., and the Jordan Valley 1 at 3,600 ft.

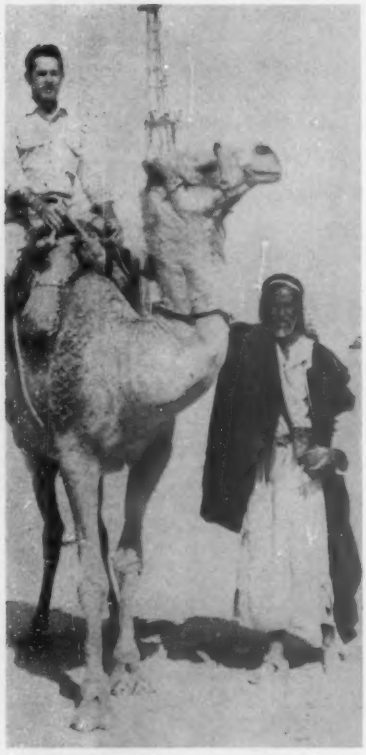
The El Lisan well was spudded last May 6. After drilling 14 structure holes for a total footage of 11,000 ft. and conducting an extensive gravity survey, Phillips decided to drill. There are numerous oil and gas seeps in this area.

Regional picture. Jordan was created as a kindom out of the desert after World War I. It is landlocked except for the small port on the Gulf of Aqaba. There are few natural resources in the country.



THIS JORDANIAN DRILLING CREW (left to right) consists of Sami Jrauh, M. Jaber, A. Taha, and H. Omar.

EL LISAN WILDCAT was drilled by Phillips on the El Lisan Peninsula in the Dead Sea Valley, lowest place on earth—1,060 ft. below sea level.



THE "DESERT SHIP" comes in handy for desert transportation. Here Jack Lewis, Phillips geologist, rides near well location.

Regional geology. The foreland of the Middle East, of which Jordan is a part, is composed of three distinct provinces.

1. The Massif zone consists of very deformed igneous and metamorphic rocks of Precambrian age. The zone determines the western and southern limits of the great sedimentary basins of the Middle East.

2. The Shelf of Arabia and adjacent lands extend over a large desert area north and east of the Massif zone.

3. The Orogenic-Geosynclinal zone is marked by the Taurus, Zagros, and Oman Mountains. Known oil fields are confined to the authochthone belt and to the adjacent parts of the foreland.

The oldest producing formations in the Middle East are Paleozoic Nubian sandstones in the small Gulf of Suez fields, and the Triassic limestone in Butmah 2, a small well in northern Iraq. Jurassic limestones hold the huge oil fields of Saudi Arabia and those in Qatar. Kuwait's big oil comes from the Middle and Lower Cretaceous sandstones as does the Wafra and Safaniya oil. Cretaceous limestones produce at Karatchok in northeastern Syria, Ain Zalah in northern Iraq, Kirkuk, South Iran, Basrah, Wafra, Manifa, Bahrain, Umm Shaif, and Murban. The big fields in northern Iraq and southern Iran are producing from Tertiary limestones.

The distance between the northernmost fields at Ramandag, Karatchok, and Ain Zalah to the southernmost fields in the gulf region is 1,200 miles. The area of prospective oil territory in the Middle East is about 600,000 sq. miles. This huge area excludes much of Sinai, Israel, Jordan, Lebanon, Syria, Turkey, Iran, Saudi Arabia, Oman, and Hadhramaut.

The vast Middle East is the leading source of world oil. Production is scattered for great distances throughout the region. But Jordan still lies in wait for its first discovery. There is much exploratory work yet to be done in this relatively small country. There has been far too little wildcatting yet to come up with many answers or clues to the area's oil potential. It is hoped that Phillips' exploration here in the past couple of years may be a beginning. With but Jordan and Lebanon left dry in this Middle East world of oil geologists have their work cut out for them in these two countries. Drilling in the next few years may solve the problem.

(Photos courtesy PHILNEWS).

Oil search continues in California gas field

Shell Oil Co. plans to try its hand at finding oil in the heart of a gas play in California.

Shell has staked location for the 2 McCune within ½ mile of Texaco Inc.'s 1 McCune, the gas well which turned into an oil well after being shut in for 6 months. The well has produced the only crude oil ever to come from the Sacramento Valley (OGJ, Aug. 29, p. 53).

The McCune wells are in Winters gas field in Solano County.

Texaco moved in and drilled an offset to the gas-well-turned-oil-well, but found no oil on initial tests. The second Texaco well did find gas. The well flowed at a rate of 1,600 M.c.f.d. from about 5,550 ft.

Shell has several gas wells in Winters field, but the new well will be the first the company has drilled in Section 32, where the two Texaco wells are located. Shell's nearest gas well is a mile north of Texaco's 1 McCune.

Southeast Texas field is named

The new field recently opened by Ada Oil Co. southeast of Call, in Newton County, has been designated as "Ada-Call" field.

Its discovery well, 1 W. O. Roy, has been given a potential of 90.34 bbl. of net oil daily, flowing through ⅛-in. choke with pressure of 685 psi. and gas-oil ratio of 550 cu. ft. per bbl.

Production is from Yegua sand, perforated at 6,842-45 ft.

Ada's second well is being drilled 1,530 ft. northeast of the discovery well.

The new area is 2 miles from nearest production, located in East Dougar field.

Michigan gasser switching to oil

In Michigan, Bell and Gault 1 Bissell, SE SW NE 8-4s-2w, Hanover Township, Jackson County, completed in Trenton-Black River dolomite a year ago as a discovery gas well, is now cutting oil. The wildcat, 7 miles east of the Albion-Scipio trend, was shut in from completion time to a month ago when Consumers Power Co. started to take from 1 to 3 million cubic feet of gas per day.

The well cut as much as 30 bbl. of crude in a 12-hour period and now has been shut in pending the installation of additional equipment.

Bissell well drilled Trenton at 3,838 ft. and Black River at 4,175 ft. with total depth of 4,454 ft. It had a dolomite section from 3,970 ft., and gaged 20,000 M.c.f.d. on final completion. Operators spent months working the well in an attempt to establish oil production.

Subsequent to the gas strike at least nine other tests were drilled in the area, including a 1,320-ft.-west offset, none of which encountered either dolomite, gas, or oil. Nevertheless, the more - than - year - old wildcat has become top news in the Michigan industry, straining for a new southern Michigan wildcat strike, as the play

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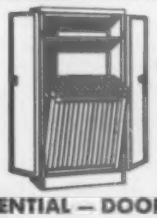
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on the trend has moved to a much slower pace the past 90 days.

• First offset to the Wright Township, Hillsdale County, 20 bbl. per day Prairie du Chien 3,700-ft. oil discovery was dry. A northeast offset drilled by Trolz and McInally at 1 Young, SW SW SE 2-8s-1w, abandoned at 3,692 ft. Trenton logged at 2,868 ft. and Prairie du Chien at 3,467 ft. Test picked up water at 3,619 ft. in a sand section.

Texas' Wadsworth adds new pay zone

A new discovery by Scurlock Oil Co. in Wadsworth field of Matagorda County, Texas Gulf Coast, adds another Frio producing zone to that already multiple-pay field.

The new pay has been designated as the Eddy sand. It is perforated at 9,660-65 ft., 9,667-69 ft., and 9,670-72 ft. Open flow potential is rated at 6,600 M.c.f. of gas and 58 bbl. of condensate daily.

Actual back-pressure tests resulted in flows ranging from 1,050 M.c.f.d. of gas through 8/64-in. choke to 2,715 M.c.f.d. of gas through 14/64-in. choke. Flowing pressures were 2,581 psi. and 2,283 psi., respectively.

Discovery well is Scurlock's 1 Ada Irene Hurst, which was drilled to 10,012 ft. Its location is 6 miles south of Bay City.

Wadsworth field was discovered in 1952 and now has approximately 20 wells with producing depths ranging from 9,000 to 11,300 ft.

About 8 miles west of Wadsworth field, the recent discovery by Humble Oil & Refining Co. of Duncan Slough field is being confirmed in this company's second well, a mile southeast of the initial producer.

The new well is completed in a deeper Frio sand than either of the two zones from which the discovery well is productive. It is perforated at 11,430-37 ft. and has an open-flow potential of 19 M.M.c.f.d. with a gas-liquid ratio of 51 M.c.f. per bbl. Discovery well produces at 10,662-70 ft. and 10,612-20 ft. Its production is oil.

Offset to Ohio well is producer

In Ohio, the first offset to Wittmer 1 Carl C. Spurgeon, a Newburg well in northeast Tiverton Township, Coshocton County, is reported as a producer. Wiser Oil Co. 2 Helen Baker, Section 9, had a gage of 5,890 M.c.f.d. after acid treatment from the pay at 2,653-63 ft. Shut-in rock pressure was 1,038 psi.

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Oxford Oil Co. got a good strike to extend Mount Perry pool in southwest Hopewell Township, Muskingum County. The Clinton sand was logged at 3,091-3,155 ft. and had an 80-gal. showing of oil in 1 Benton L. Baird, Section 17. It made 100 bbl. oil and an estimated 400 M.c.f.d. of gas in 24-hour test 1 week after fracture.

First Abo for Texas indicated

First Abo reef production for Texas is indicated at a wildcat in northwestern Gaines County, 14 miles southwest of Denver City in shallow Brown field. Discovery prospect is Union Oil Co. of California 2-1 Jones Estate in Section 1, Block A-8, PSL Survey.

Oil shows were recovered on a drill-stem test in the Abo at 7,958-8,060 ft. Recovery was 990 ft. of slightly mud-cut oil, 180 ft. of heavily gas and mud-cut oil. The wildcat is slated for 8,300 ft. Core is now being taken. Nearest Abo reef production is to the west in New Mexico's Vacuum Edge unit area.

Dawson County. The second Dean sand well in a new field in Dawson County, 2 miles northwest of Ackerly, is Santiago Oil & Gas Co. 1 Bowlin.

The well, completed last September as a Pennsylvanian reef discovery, was reentered and completed as the second Dean well for the field. It offsets to the southwest Southern Union Gas Co. 1 Jannie Pitts. Potential was 219 bbl. of flowing 39.5°-gravity oil daily through ¼-in. choke from perforations at 8,410-8,552 ft. Location is in Section 3, Block 34, T-3-N, T&P Survey.

North Texas. A new Mississippian oil field was opened 7 miles northeast of Albany in northeastern Shackelford County. Discovery is Gulf Oil Corp. 1 Walker-Buckler Trust in Section 383, TE&L Survey, 1½ miles east of Gem Caddo and Mississippian field.

The well flowed 249 bbl. of oil on a 4-hour test for a calculated daily potential of 1,498 bbl. on 28/64-in. choke from Mississippian perforations at 4,583-4,615 ft.

Young County. Northeastern Young County has a new Mississippian discovery at A. B. Edwards et al. 1 Bernice Slater. The well flowed 142 bbl. per day through open hole in Mississippian. Total depth is 4,915 ft. with 5½-in. production pipe cemented at 4,890 ft. Location is 7 miles north of Graham and 2 miles west of Boren Strawn field in Section 643, TE&L Survey, A-801. Field name will be Slater Mississippian.

James line is target in East Texas play

SPREADING development of James lime (Rodessa) production in the Frankston area of northeastern Anderson and southeastern Henderson counties, in East Texas, is taking on the aspects of a major play.

Completion of two more good wells in the Fairway extension area, on the Anderson County side, gives this recently opened pool four wells.

One of these wells is 2 miles west of the new producing area. It may be designated as opening a new pool rather than an extension. Operators have requested it be called "West Fairway" field.

The other completion is an offset to the area's first confirmation well, ½ to ¾ mile southwest of the discovery well. It appears to be a better producer than either the discovery or confirmation well, both of which were good.

Flow through 12/64-in. choke was gaged at the rate of 570 bbl. daily with pressure of 2,500 psi., and gas-oil ratio of 1,212 cu. ft. per bbl. Its James lime pay is perforated at 9,928-52 ft. and 9,960-84 ft. This compares with the depth of the other wells.

The new long-extension well flowed 178 bbl. daily with 27 bbl. of water while testing through 14/64-in. choke. It is perforated at 9,868-88 ft. and 9,898-9,924 ft.

All the new wells so far in the new area have been drilled by Fairway Operating Co. of Tyler. Discovery well, 1 Wofford, was completed last August with a flow of 420 bbl. daily through 12/64-in. choke from perforations at 9,959-72 ft. Oil gravities in all the wells are comparable, running 47° to 48° plus.

Fairway's confirmation well, 1 W. E. Moore Estate, ½ mile southwest, flowed 467 bbl. daily through the same-sized choke with pay at 9,989-91 ft. The newly completed offset to this well is Fairway's 1 Westbrook. The other new well, 2 miles west, is on the company's Maymon lease.

The new Fairway area is just west of the town of Frankston. The discovery well, at the present most northerly location, is about 2 miles southwest of the original Frankston field, on the Henderson County side of the line. That field, also productive from the James lime, was opened by Cities Service Oil Co. in March 1955 with pay at 10,050-64 ft.

In the meantime, three additional wells are being started. Fairway is drilling two of these, one being its 1 Wilkerson, 1½ miles southwest of the discovery well, and the other, its 1-B Olga Lupkin, 2 miles west of production. The latter is 3 miles northwest of Frankston, in Henderson County. It is just northeast of Fairway's 1 Olga Lupkin, an old hole which Fairway is redrilling and deepening from 8,630 ft. to 10,058 ft.

The third new test is being drilled by Frank and George Frankel on their Henley lease, offsetting Fairway's discovery well on the north.

Discovery wells

COLORADO

Morgan County:

San Arroyo Creek. Kimbark Exploration Co. 1 McVey, C NW SW 34-1n-58w. IPP 13 BO, 37 BWPD, "D" sand 5,744-48 ft. TD 5,917 ft. "D" sand discovery, new Denver basin field.

(Continued on page 187)

Here's Canadian drilling for October . . .

	TOTAL WELLS							WILDCATS					
	Total	Oil	Gas	Dry	Service	Footage	Cum. 1960	Total	Oil	Gas	Dry	Footage	Cum. 1960
Western Canada	**218**	**134**	**26**	**57**	**1**	**1,168,778**	**2,044**	**55**	**6**	**10**	**39**	**210,943**	**538**
Alberta	146	85	22	38	1	889,563	1,392	39	5	9	25	240,394	359
Saskatchewan	53	39	0	14	0	201,727	463	12	1	0	11	38,214	100
Manitoba	8	8	0	0	0	16,847	54	0	0	0	0	0	8
British Columbia	11	2	4	5	0	60,641	121	4	0	1	3	25,369	57
Northwest Territories	0	0	0	0	0	0	14	0	0	0	0	0	14
Ontario	13	1	6	5	1	13,643	243	..	..	..	..	.....	...

Over Capacity Biggest Worry

. . . facing refiners. That's the way it looks to Al Frame as he begins his term as API vice president for refining.

IT'S A long trek from Halifax, Nova Scotia, to the oilfields of the U. S. Southwest. It was even longer when A. P. Frame made the trip back in 1921, armed with a brand new BS degree from Dalhousie University.

With nothing more specific in mind than "going to oil country," he wound up in Oklahoma. There he garnered a bottom-rung job in natural-gasoline plants serving the Cleveland and Slick fields of Pawnee and Creek counties.

This first trip was prophetic. Al Frame has since criss-crossed the nation in a succession of assignments of growing importance. His latest: API's vice president for refining.

By 1924, young Frame made his first connection with Cities Service as a maintenance clerk at the Empire refinery in Ponca City.

Soon he was plant engineer, then engineer for all four Empire refineries with headquarters in Tulsa. Following a 10-year hitch as superintendent of the Cities Service plant at Petty's Island, N. J., he moved over to lower Manhattan as assistant director of refining for Petroleum Advisors, a Cities Service affiliate.

In the early war years, Frame was vice president and chief engineer of Cities Service Refining Corp. at Lake Charles. During this time the company's massive new refinery was constructed along the Calcasieu River.

Then came what he believes was his greatest "break." He spent 1944 and 1945 as Director of Refining for PAW. Two wonderful things happened during this period, says Frame. He had the opportunity to become acquainted with refiners throughout the country. And, he gained a valuable insight into the organization, practices, and processing know-how of the industry at large.

This experience served Frame well as associate deputy of PAD in 1952 and 1953. It also gives him valuable background in directing API's Refining Division for the next 2 years.

A. P. Frame
. . . first trip set the pattern.

Today Al Frame is senior vice president of Cities Service Co., a post he has held since 1952. He sees excess refining capacity as the industry's greatest problem. We have never had adequate product prices when our operations were less than 90% of capacity, says Frame. He sincerely hopes that the industry will refrain from resuming its over building of the recent past. We must hold the line until demand has caught up if we are ever again to see a fair return from refining operations, he concludes.

Gilbert N. Steile, associate petroleum engineer with Ohio Oil Co., has been transferred to Hobbs, N. M., from Iraan, Tex.

Arthur S. Dickinson, district geologist for Monsanto Chemical Co.'s Lion Oil division in Houston, has been named exploration geologist. The assignment places Dickinson on a level comparable to regional geologist or regional exploration manager, but without the administrative duties. It is the first appointment made under Lion's new scientific advancement plan (OGJ, Nov. 14, p. 108).

Dr. R. W. Brauchli has retired as vice president of exploration and production for Anderson-Prichard Oil Corp. Brauchli has been with Apco since 1926. He was named exploration vice president in 1947 and became head of the combined exploration and production groups earlier this year.

▶▶▶ Personals

Don R. Greenwalt, production engineer with Tidewater Oil Co., has been transferred to Houston from Victoria, Tex.

Rudolph Cucicciotti, vice president of Sonneborn Chemical & Refining Corp., has been elected administrative vice president of Witco Chemical Co., the parent company.

Edward L. Steiniger, president of Sinclair Oil Corp., has been elected a director of Richfield Oil Corp. He succeeds **P. W. Thirtle,** who has retired as a director. Sinclair owns 30½% of Richfield stock. **P. C. Spencer,** Sinclair chairman, is also a Richfield director.

Robert H. Darling, assistant plant manager for engineering, maintenance, and construction at Jefferson Chemical Co.'s Port Neches, Tex., plant, has been promoted to plant manager there. Darling was with Texaco Inc. before joining Jefferson Chemical in 1955 as chief engineer of the Port Neches plant.

Byron L. Keil, engineer with Wilson Exploration Co., Fort Worth, has been elected a vice president. He will be in charge of production and contract-property management operations. **Hugh B. Downing** has been named secretary-treasurer for the company.

John K. McKinley has been appointed general manager of the petrochemical department of Texaco Inc. He will headquarter in New York. McKinley most recently had been manager of commercial-development processes for the research and technical department in Beacon, N. Y. He also has served as supervisor of cracking research at the Port Arthur, Tex., refinery, and assistant director of research at Beacon.

Gerald W. Pike, Pickrell Drilling Co., Wichita, has been elected 1961 persident of Kansas Geological Society. He will succeed **M. F. (Ted) Bear,** Wichita consultant, January 1. Other new officers are **Robert J. Gutru,** Beardmore Drilling Co., vice president; and **Orvie L. Howell,** Lario Oil & Gas Co., secretary-treasurer. **John S. Miller, Jr.,** Messman-Rinehart Oil Co., was elected a director.

▶▶▶ Personals

W. J. Bowen, senior vice president and a director of Houston Corp., has been named president of the natural-gas pipeline company. He succeeds **F. E. Stanley,** who became board chairman last July. **J. French Robinson,** former chairman of Consolidated Natural Gas Co., has been elected chairman of the Houston Corp. executive committee. He became a director of the company earlier this year. Bowen is a 38-year-old West Point graduate and former engineer for Delhi-Taylor Oil Corp. (OGJ, Oct. 27, 1958, p. 149). One of the early officials of the company organizing the gas line to Florida, he stepped into the presidency of Coastal Transmission Corp. in the summer of 1956. Coastal Transmission and Houston Texas Gas & Oil Corp. are operating subsidiaries of Houston Corp. Last July, Bowen became president of the second subsidiary. He has been a senior vice president of the parent company since 1958 and has been chief executive officer since Stanley became chairman earlier this year.

BOWEN

Remick McDowell, president and a director of Peoples Gas Light & Coke Co., has been elected chairman and chief executive officer. He will succeed **Eskil I. Bjork,** who will retire as chairman March 1. Bjork has been elected chairman of the executive committee and will continue as a director. **Leslie A. Brandt,** vice president and comptroller, will succeed McDowell as president. **Elmer F. Schuldt,** chief operating engineer, has been named to succeed **John J. Novy** as assistant vice president, operation division. Novy will retire February 1. **Ward C. McCallister,** an assistant comptroller, has ben named vice president and comptroller, succeeding Brandt. In other appointments, **Wilfred G. Pilgrim** has been named assistant vice president. He will continue as assistant comptroller. **Allan J. Good,** treasurer, has been named assistant vice president, finance and public relations division. **William H. Hollweg** will succeed Good as treasurer and will continue as assistant secretary. **Edwin M. Taber** has been named secretary and will continue as assistant treasurer.

H. Dean Chrislip, general manager of the pipeline division for Kerr-McGee Oil Industries, Inc., has been named manager of the new crude-oil supply and transportation division. The new division combines the former crude-oil supply and pipeline divisions. **J. H. Tubbs,** general manager of the old crude-oil supply division, recently retired. **Byron T. Foster,** crude-oil representative, has been appointed manager of purcheses and sales in the new division.

R. C. Randolph, engineer at Ohio Fuel Oil Co.'s McArthur, Ohio, compressor station, has retired after 17 years with the company.

Robert A. Meaders, engineer with British-American Oil Producing Co., has been transferred to Dallas from Denver.

Gordon H. White, Sohio Petroleum Co.'s assistant manager for exploration, has been named manager of domestic exploration. **Dwight H. Seely, Jr.,** manager of Gulf Coast exploration, has been given a temporary assignment in Cleveland. **Clifton E. Storm, Jr.,** Gulf Coast land manager, will be acting area exploration manager in Seely's absence.

Joseph P. D. Hull, Jr., geologist with Kerr-McGee Oil Industries, Inc., in Calgary, has been promoted to district geologist in Pittsburgh.

William H. Morris, president of Sinclair Oil & Gas Co., and **C. J. Allen,** president of Sinclair Refining Co., have been elected directors of Sinclair Oil Corp., the parent company. Morris has been with the Sinclair companies since 1933. He was president of Sinclair Pipe Line Co. before being named Sinclair Oil & Gas president in 1957. Allen was an administrative vice president of the parent company before his recent election as president of Sinclair Refining. The new directors succeed **W. F. Dau** and **H. L. Phillips,** who have retired.

MORRIS

ALLEN

P. A. Medcraft has been named general manager of BP Tanker Co., Ltd., subsidiary of British Petroleum Co. He succeeds **D. G. L. Bean,** who has been appointed general manager of the parent company's supply and development department.

J. A. McQuilkin, a director of Standard - Vacuum Oil Co., has been named a vice president and member of the executive committee. McQuilkin was general manager of Stanvac's Malaya-Thailand division before joining the headquarters staff in 1950. He also has been territory manager for Thailand and Malaya-Thailand division sales manager. He was elected a director in 1952.

Bill Woodrum, division administrative coordinator in Continental Oil Co.'s New Mexico division, Roswell, has been promoted to regional administrative coordinator for the western region production department. He will headquarter in Los Angeles.

R. H. O'Connor, formerly with Sun Oil Co., has been named research geologist for Canadian Homestead Oils, Ltd. **W. J. Smart,** Canadian Fina Oil, Ltd., has joined Canadian Homestead as field engineer. **C. D. Borggard,** formerly with Calgary & Edmonton Corp. and Merrill Petroleums, Ltd., has been named chief land man for Canadian Homestead. **Duane E. Wikant,** chief accountant and assistant treasurer of Petcal Co., Ltd., a Canadian Homestead subsidiary, has been named treasurer of the parent company.

Ernest Cotton has been appointed departmental coordinator in Gulf Oil Corp.'s manufacturing department. He will be responsible for development of manufacturing plans and economic analyses of departmental activities. **K. S. Manning** has been named coordinator of product supply, manufacturing department. He will be in charge of development of the domestic product-supply program and coordination of the world-wide product supply program. Cotton had been director of economics and planning for the manufacturing department. Manning was director of the department's supply and scheduling division. In other manufacturing department appointments, Gulf has named **M. L. Ralston** director of departmental planning and economics. **J. N. McGarvey** has been named director of domestic-product supply, and **C. H. Goldstrom** has been appointed director of foreign-product supply. All five will headquarter in Pittsburgh.

Personals

H. W. McCobb, vice president and a director of Standard-Vacuum Oil Co., has moved to Standard Oil Co. (N. J.) as regional coordinator for the company's operations in Asia, Australasia, and part of Africa. The appointment follows Jersey's recent announcement of reorganization plans for its interests in the Far East, Southeast and South Asia, Australasia, and South and East Africa. McCobb was with Jersey's Columbian affiliate before moving to Indonesia with Stanvac in 1934. He became head of Stanvac producing operations in 1946 and has been a vice president since 1951.

Roger M. Dungan, senior geologist for Continental Oil Co. in Houston, has been promoted to Los Angeles exploration division geologist. **Frank P. Williamson,** technical assistant to the general manager of petrochemical manufacturing in Houston, has been named assistant superintendent of Conoco's Baltimore petrochemical plant.

Robert E. Vickrey, senior gas engineer for Sun Oil Co., has been named chairman of the Dallas section of AIME's Society of Petroleum Engineers. He succeeds **J. H. Sullivan,** Atlantic Refining Co. Other section officers are **Tom G. Calhoun II,** DeGolyer & MacNaughton, and **Tom L. Kennerly,** Core Laboratories, Inc., vice chairmen; **Sidney H. Davis,** Atlantic Refining, secretary; and **H. Ed Ellis, Jr.,** Republic National Bank, treasurer. New directors are **Marshall K. Fagin,** Southwestern Life Insurance Co.; **Ernie H. Koepf,** Core Laboratories; and **Russell E. Leeser,** British-American Oil Producing Co.

S. J. Mathews, Jr., Gulf Coast district production superintendent for Standard Oil Co. of Texas in La Porte, Tex., has been transferred to the Ward-Hobbs district, Monahans, Tex., in the same capacity. **H. F. Copeland,** southern district production superintendent in Corpus Christi, Tex., has been transferred to the northern district in Gainesville, Tex., as production superintendent. **J. M. McMahan,** supervisor of drilling and production engineering, has been named eastern production division engineer in Houston. **D. R. Boggs,** chief accountant, has been named manager of income and excise taxes in Houston.

Stephen D. Bechtel, Jr., executive vice president and chairman of the executive committee of Bechtel Corp., has been elected president. **S. D. Bechtel, Sr.,** will continue as chairman. Bechtel, Jr., joined the company as a student engineer. In 1948, he began full-time employment as a field engineer. He became vice president and manager of pipeline operations in 1952. He was named senior vice president in 1955 and executive vice president in 1957. He is chairman of Canadian Bechtel, Ltd.

BECHTEL, JR.

I. Hayden Hughes, general manager of Pan American Argentina Oil Co. in Buenos Aires, has been named executive vice president of Pan American International Oil Corp. with headquarters in New York. The appointment is effective January 1. **Edgar E. Martin,** formerly with Pauley Petroleum, Inc., in Mexico, will succeed Hughes with Pan American Argentina. Hughes had been with Phillips Petroleum Co., International Petroleum Co., and Sunray Mid-Continent Oil Co. before joining Pan American.

HUGHES

Norman Newton, process superintendent of Continental Oil Co.'s Wichita Falls, Tex., refinery, has been promoted to refinery superintendent. He succeeds **M. H. Clark,** who last week was named manager of the new Panama refinery of Refineria Panama, S.A., an affiliate.

G. I. Samson, Phillips Petroleum Co., is newly elected president of the Western Canada Oil Scouts Association. Other new officers are **J. W. Heap,** Canadian Superior of California, Ltd., vice president; **G. R. McMurdo,** British American Oil Co., Ltd., secretary; and **Jules Poscente,** Altana Exploration, Ltd., treasurer. **R. M. O'Keefe,** Ohio Oil Co., and **R. Johnson,** Great Plains Development Co., of Canada, Ltd., were reelected editor and associate editor. **M. H. Doherty,** Texaco Exploration Co., is outgoing president.

Deaths

Dr. R. P. Anderson, 73, retired secretary of American Petroleum Institute's Division of Refining, died November 26 in a West Chester, Pa., hospital. Anderson was chief chemist with United Natural Gas Co., Oil City, Pa., before joining the API staff in 1924. He retired in 1944 after 13 years as Refining Division secretary.

Sol Kelly, 62, Midland, Tex., independent operator, died December 1 in a Dallas hospital after a 3-week illness. Kelly was a member of a group which in 1921 completed the discovery well in Westbrook field, first commercial oil production in West Texas. He entered the oil business at Burkburnett field in 1917 and had been active in Ranger and Breckenridge areas before moving to West Texas. Recently he had extended his operations into New Mexico, Utah, and Canada.

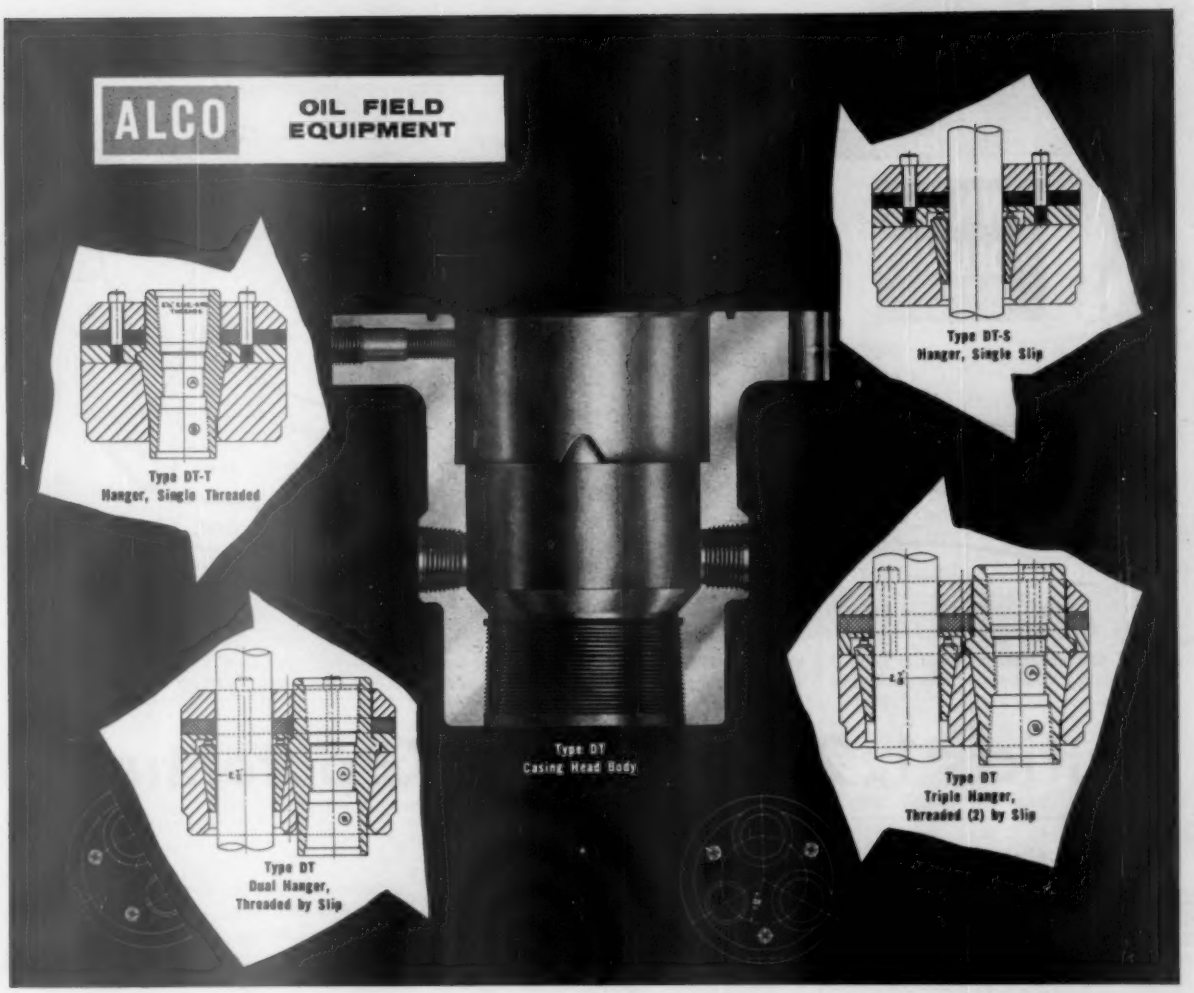
Henry D. Mullineaux, Sr., 73, retired assistant comptroller of Atlantic Refining Co., died November 25 at his home in Norristown, Pa. Mullineaux retired in 1952 after 49 years with the company.

Charles R. Hartman, 84, retired service engineer for Cooper-Bessemer Corp. in Tulsa, died December 1 at his home in Edmond, Okla., after a year's illness. Hartman was with the old Cudahy Oil Co. before joining Bessemer Gas Engine Co., predecessor of Cooper-Bessemer. He retired in 1956 after almost 50 years with the company.

Abe Mizel, 76, operator of Central Supply Co., Tulsa, died December 4 in a Tulsa hospital. Mizel formed the supply company in 1932.

Frank Paxson, 59, foreman in Continental Oil Co.'s mechanical division, Ponca City, Okla., died December 3 in a Ponca City hospital.

Ward W. Dayton, head of Ward W. Dayton Oil Production Co., Chicago, since 1949, died November 22.



NEW ALCO TUBINGLESS COMPLETION WELLHEAD EQUIPMENT

Features interchangeability of hangers in the same casing head

Alco's exclusive design allows single, dual and triple (in 10" nominal head) to be interchangeable within the same casing head. Quads also furnished with the same interchangeability in 12" nominal casing head. Slips and threaded mandrels are interchangeable within the different hanger bowls. The lower bowl segment of an individual hanger is the same item, and can be used with either slip or threaded suspension. Any combinations of slip and threaded suspension can be obtained. To change from threaded to slip suspension, the operator needs only to order slips and packing element.

Another outstanding feature in this design is that the bowl will pass 4-⅛" O.D. centralizers on either side. Mandrel suspension or slip suspension hangers are furnished in this design. Installation time and cost are greatly reduced. For complete information and literature write Alco Products, Inc., 444 Bank of the Southwest Bldg., Houston, Texas.

ALCO PRODUCTS, INC., New York • Sales Offices in Principal Cities • Makers of: *Heat Exchangers Weldments • Locomotives • Nuclear Reactors • Diesel Engines • Springs • Steel Pipe • Forgings • Oil Field Equipment*

ALCO

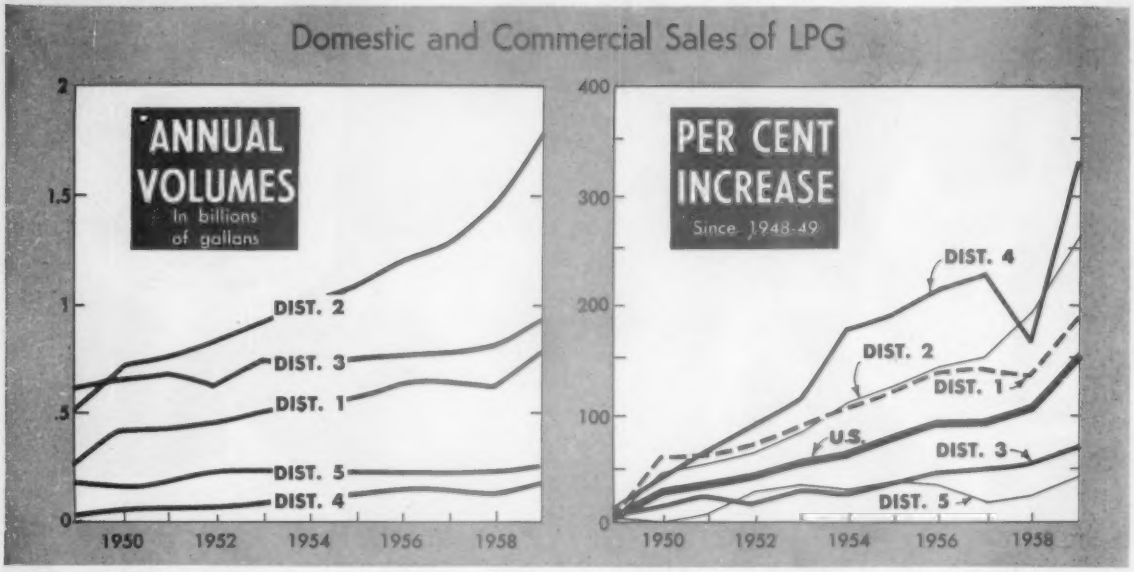


CHART ON LEFT shows District 2 as the leader in LPG sales since 1950, followed in order by Districts 3, 1, 5, and 4. Note on the right chart that Districts 3 and 5 are the only areas with gains less than 100% since the 1948-49 base period.

Districts 1, 2 show big LPG potential

BY JOHN C. CASPER

DISTRICT 2 has been the big domestic and commercial market for LPG in the postwar period, but the southeastern area of the country is showing signs of growth that may move District 1 from third place to second.

Note the commanding position held by District 2 in the first chart. Sales in the district passed a billion gallons per year in 1954 after gaining 483 million gallons in the first half of the period. The increase in the last 5 years has been even more impressive with a boost of 778 million gallons.

The gain in sales in District 2 over the past 5 years has been larger than total sales for 1959 in District 1.

The outlook is for continuing gains in the district. Mid-America Pipeline Co.'s new 2,200-mile system from New Mexico to Wisconsin and Minnesota will go into operation this heating season. Lower transportation costs for this valuable fuel will add to the competition between LPG and distillate fuels in this big market area across the north central part of the country.

The bottom line on the first chart shows sales in District 4. The total was up almost to 200 million gallons last year after starting with less than 50 million gallons in 1949. Calculations from this low base give this district the highest percentage gains in the country.

District 1 is slated to become an outstanding market for LPG over the next 5 years. Note on left hand that it has ranked third in sales volume in the postwar period. Also, note that it has been gaining on District 3.

District 1 marketers sold 483 million gallons more in 1959 than in 1949. These sales were to domestic and commercial customers, not total sales. Note that there were two big gain years, in 1950 and in 1959.

A large part of the growth is expected to be in the southern half of District 1. The area south of Pennsylvania accounted for 59% of East Coast sales in 1959 compared with 53% in 1950.

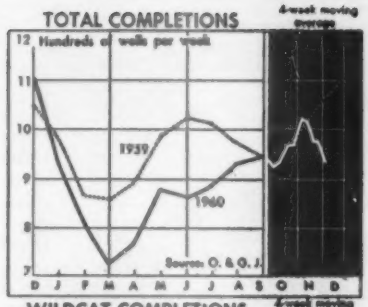
At least one LPG pipeline from Texas to the southeastern area will be completed within the next 2 years. Transcontinental Gas Pipe Line Corp. has announced a line and has set tentative but maximum rates from Houston to Danville, Va.

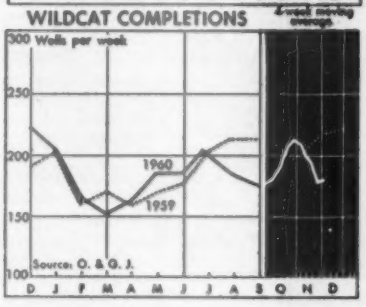
Another group of companies, including both producers and marketers, has announced preliminary plans for a line to serve the same general area. At least one of these lines should be in partial operation for the 1961-62 heating season. District 1 will be crowding District 3 for second place on domestic sales. Note District 3's low percentage gains on right-hand chart.

A quick look at the highlights . . .

	LATEST WEEK	Change from WEEK AGO		Change from YEAR AGO	
Production	6,978,400	DOWN	14,085	DOWN	151,600
Crude stocks	236,783,000	DOWN	253,000	DOWN	15,882,000
Completions	916	DOWN	32	UP	158
Refinery runs	7,834,000	DOWN	258,000	DOWN	149,000
Gasoline stocks	187,242,000	DOWN	664,000	UP	5,836,000
Kerosine stocks	36,906,000	DOWN	197,000	UP	6,551,000
Distillate stocks	172,642,000	DOWN	3,099,000	UP	8,549,000
Residual stocks	49,339,000	UP	531,000	DOWN	4,559,000
Four-product stocks	446,125,000	DOWN	3,429,000	UP	16,377,000
Total imports	1,651,400	DOWN	224,800	DOWN	189,100

Active Rotary Rigs





	12-5-60	11-28-60	12-7-59
Alabama	6	5	6
Alaska	8	8	(†)
Arkansas	10	10	14
Arizona	1	1	0
California	69	74	90
Land	67	71	84
Offshore	2	3	6
Colorado	34	43	43
Florida	3	4	2
Land	2	2	2
Offshore	1	2	0
Georgia	2	0	0
Illinois	34	33	42
Indiana	8	8	9
Kansas	129	129	165
Kentucky	7	6	8
Louisiana	278	274	315
North	36	35	45
S. Inland waters	101	104	114
S. Land	88	79	99
Michigan	31	32	29
Mississippi	47	45	81
Missouri	1	1	1
Montana	24	20	23
Nebraska	23	25	28
New Mexico	116	114	128
New York	2	2	0
North Dakota	10	11	24
Ohio	5	5	2
Oklahoma	212	200	247
Pennsylvania	12	6	14
South Dakota	1	1	6
Tennessee	1	0	0
Texas	650	657	782
S. Inland waters	7	5	3
S. Land	177	185	193
Offshore	2	0	3
North	59	56	206
Panhandle	60	61	(*)
East	53	47	(*)
West Central	‡168	‡176	243
West	124	127	134
Utah	33	30	31
Washington	1	1	1
West Virginia	6	6	4
Wisconsin	1	1	0
Wyoming	70	64	72
Total U. S.	1,835	1,816	2,167
Western Canada	153	141	198
Eastern Canada	0	0	1
Grand total	153	1,957	2,366

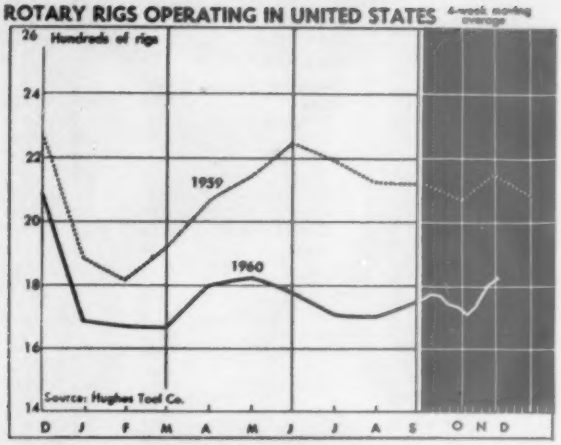
Hughes Tool Co. report. *Included in North. Comparisons not available due to change in method of reporting. †Data first reported 4-4-60. ‡Stephens and Eastland counties now included in West Central Texas.

WEEKLY WELL COMPLETIONS . . . WEEK ENDED DECEMBER 3, 1960

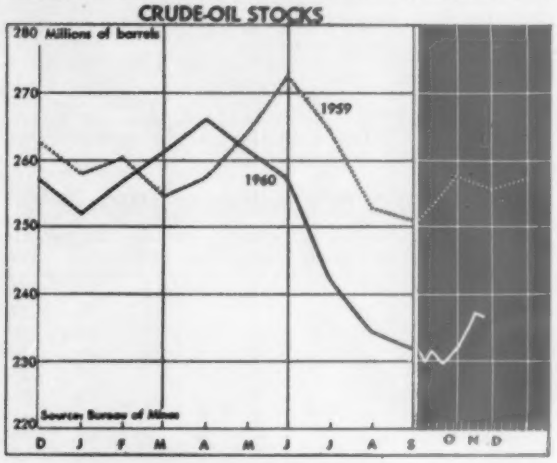
	Total wells							Cum.		Total wildcats					Cum.	
	Total	Crude	Cond.	Gas	Dry	Service	Footage	1960	1959	Total	Crude	Cond.	Gas	Dry	1960	1959
Arkansas	12	7	0	0	5	0	46,446	562	780	4	1	0	0	3	141	141
California	50	34	0	3	13	0	184,654	1,583	1,433	10	0	0	1	9	284	381
Colorado	12	0	0	5	7	0	67,566	613	722	5	0	0	1	4	308	409
Illinois	43	13	0	0	13	17	100,440	2,175	2,193	11	1	0	0	10	461	365
Indiana	13	6	0	0	7	0	15,486	986	802	0	0	0	0	0	347	273
Kansas	82	43	0	4	30	5	243,010	3,841	3,707	29	2	0	3	24	974	987
Kentucky	58	54	0	1	3	0	64,161	2,035	2,929	0	0	0	0	0	213	346
Louisiana	76	51	4	2	19	0	553,009	3,383	3,516	7	1	0	0	6	514	372
North	35	24	0	1	10	0	113,968	1,331	1,396	6	1	0	0	5	251	215
South	35	23	3	1	8	0	366,347	1,591	1,739	1	0	0	0	1	232	242
Offshore	6	4	1	0	1	0	72,694	461	381	0	0	0	0	0	31	15
Michigan	12	5	0	1	6	0	40.047	873	609	4	0	0	0	4	237	172
Mississippi	15	7	0	1	7	0	156,379	627	595	7	1	0	0	6	243	263
Montana	5	1	0	0	4	0	28,400	317	319	4	0	0	0	4	150	115
Nebraska	8	2	0	0	6	0	38,289	810	836	5	1	0	0	4	357	363
New Mexico	25	13	0	3	9	0	132,096	1,721	1,949	4	0	0	0	4	240	230
West	11	3	0	3	5	0	60,262	628	863	2	0	0	0	2	69	60
East	14	10	0	0	4	0	71,834	1,093	1,086	2	0	0	0	2	171	170
New York	13	5	0	0	2	6	23,419	295	256	0	0	0	0	0	39	19
North Dakota	4	0	0	0	4	0	31,129	266	410	3	0	0	0	3	79	77
Ohio	18	6	0	7	4	1	56,640	993	1,013	1	0	0	0	1	47	31
Oklahoma	152	79	2	15	38	18	540,584	4,348	5,090	25	8	2	3	12	660	779
Pennsylvania	0	0	0	0	0	0	0	663	523	0	0	0	0	0	16	19
Texas	264	154	12	5	82	11	1,003,913	14,374	17,119	46	5	1	0	40	2,937	3,237
Dist. 1	26	16	0	0	10	0	78,594	1,039	1,008	6	0	0	0	6	369	309
Dist. 2	13	4	2	0	7	0	92,716	698	753	2	0	0	0	2	172	219
Dist. 3	15	7	2	2	4	0	79,940	1,082	1,101	3	0	0	0	3	208	218
Dist. 4	12	5	0	0	7	0	53,665	988	1,247	6	0	0	0	6	273	311
East	28	19	5	0	4	0	123,529	1,218	1,169	5	1	0	0	4	250	230
Dist. 7-B	38	16	2	1	17	2	131,187	2,030	2,382	13	3	1	0	9	575	629
West	55	44	0	1	9	1	245,767	3,669	5,105	4	0	0	0	4	575	692
Dist. 9	65	37	0	0	20	8	134,229	2,683	3,185	5	0	0	0	5	460	529
Dist. 10	12	6	1	1	4	0	64,286	967	1,169	2	1	0	0	1	55	100
Utah	8	3	0	0	5	0	44,407	223	288	5	0	0	0	5	86	88
West Virginia	17	1	0	16	0	0	51,678	791	735	0	0	0	0	0	9	27
Wyoming	26	11	0	0	13	2	133,204	990	901	10	0	0	0	10	400	328
Miscellaneous (Alaska) (Ga.)	3	0	0	1	2	0	18,310	245	220	2	0	0	0	2	163	111
Total U. S.	916	495	18	64	279	60	3,573,267	42,714	46,945	182	20	3	8	151	8,905	9,233
Prev. week	948	416	30	78	341	83	3,382,730	.....	.....	162	11	3	7	141	.....	.....
Cum. 1960	42,714	19,340	1,229	3,590	16,116	2,439	175,618,841	.....	.....	8,905	809	99	302	7,695	.....	.....
Cum. 1959	46,945	23,430	1,150	3,465	17,589	1,311	193,425,261	.....	.....	9,233	822	101	304	8,006	.....	.....
Western Canada	24	16	0	2	6	0	112,272	2,106	2,244	4	1	0	1	2	549	618

PRODUCTION

ROTARY RIGS OPERATING IN UNITED STATES



CRUDE-OIL STOCKS



CRUDE-OIL STOCKS BY STATES OF ORIGIN*

(Thousands of barrels)

	11-26-60	11-19-60	11-28-59
Pennsylvania	2,344	2,310	2,511
Other Appalachian	1,299	1,323	2,097
Illinois, Indiana, Michigan	9,009	9,164	10,010
Nebraska and North Dakota	2,889	2,686	3,096
Kansas	8,956	8,985	9,626
Oklahoma	15,197	15,582	14,822
Arkansas	1,853	1,822	2,028
Louisiana	18,448	18,438	18,560
North	3,247	3,307	3,233
South	15,201	15,131	15,327
Mississippi, Alabama, Florida	2,051	2,038	2,181
New Mexico	8,292	8,778	8,120
Texas	98,598	99,453	111,526
East Texas	7,422	7,436	8,136
West Texas	46,386	46,882	52,485
Texas Gulf	17,324	17,555	20,014
Other Texas	27,466	27,580	30,891
Wyoming	16,397	15,592	17,040
Other Rocky Mountain	10,210	10,421	8,916
California	25,582	25,684	28,942
Foreign	†15,658	14,760	13,190
Total	236,783	237,036	252,665

*Bureau of Mines. †Includes 4,944,000 bbl. in California.

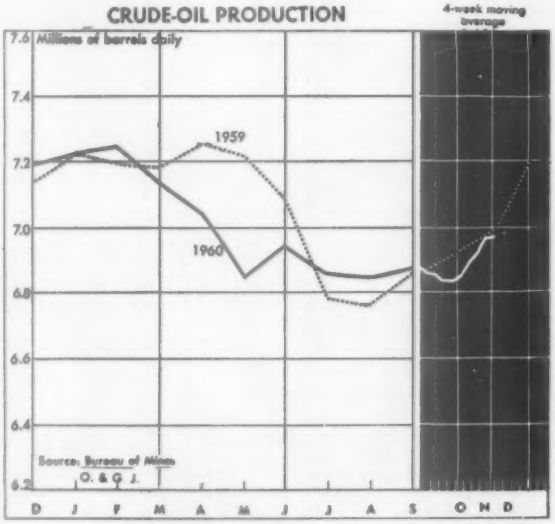
DAILY AVERAGE PRODUCTION FOR WEEK

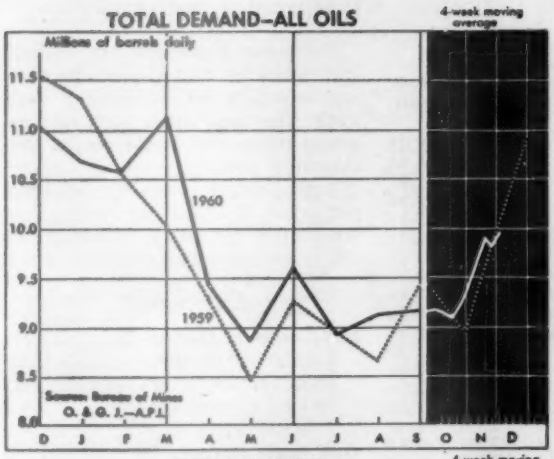
	December 3, 1960 — Crude oil	Lease condensate	Total	Nov. 26 total
Alabama	21,375	.....	21,375	21,300
Arkansas	74,750	150	74,900	74,650
California	833,500	.....	833,500	832,950
Colorado	132,900	.....	132,900	131,800
Eastern	39,800	.....	39,800	38,700
Florida	925	.....	925	950
Illinois	221,600	.....	221,600	229,800
Indiana	32,200	.....	32,200	32,200
Kansas	†294,025	.....	†294,025	†310,110
Kentucky	58,400	.....	58,400	58,900
Louisiana	967,675	135,200	1,102,875	1,099,950
North	105,400	5,200	110,600	110,450
South	862,275	130,000	992,275	989,500
Michigan	48,400	.....	48,400	48,100
Mississippi	146,425	4,100	150,525	149,525
Montana	82,800	.....	82,800	82,100
Nebraska	66,200	.....	66,200	66,500
Nevada	50	.....	50	50
New Mexico	289,150	8,500	297,650	296,700
North Dakota	66,000	.....	66,000	65,700
Oklahoma	†481,400	.....	†481,400	†515,600
Texas	2,409,275	90,000	2,499,275	2,460,200
Dist. 1	43,275	3,200	46,475	46,200
Dist. 2	101,575	8,300	109,875	107,300
Dist. 3	307,150	38,350	345,500	340,000
Dist. 4	172,575	12,200	184,775	182,200
Dist. 5	25,575	500	26,075	25,500
Dist. 6	104,000	9,800	113,800	111,800
East Texas field	127,275	.....	127,275	125,000
Dist. 7-B	121,575	400	121,975	121,250
Dist. 7-C	115,575	3,150	118,725	118,050
Dist. 8	993,850	10,400	1,004,250	984,000
Dist. 9	196,850	2,000	198,850	197,800
Dist. 10	100,000	1,700	101,700	101,100
Utah	106,800	.....	106,800	112,200
Wyoming	365,100	.....	365,100	362,800
Others	‡1,700	.....	‡1,700	‡1,700
Total U. S.	6,740,450	237,950	6,978,400	6,992,485
Change from previous week, down			14,085	
Canada	†515,500	.....	†515,500	†552,500

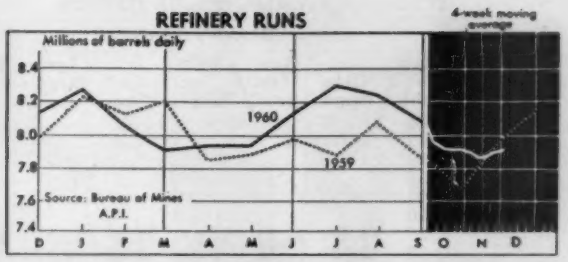
Total U. S. prod., Jan. 1-Dec. 3 ..... 2,368,766,500 bbl.
Same period last year (crude plus cond.) ..... *2,373,041,700 bbl.

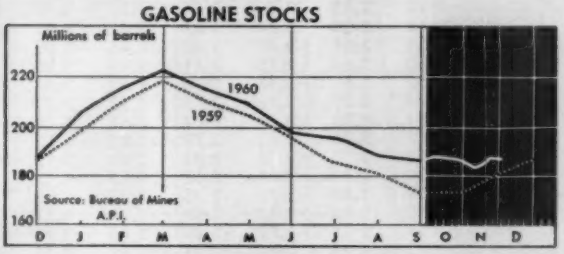
*Includes 63,747,600 bbl. condensate. †Week ended previous Monday. ‡Alaska, South Dakota, and Arizona.

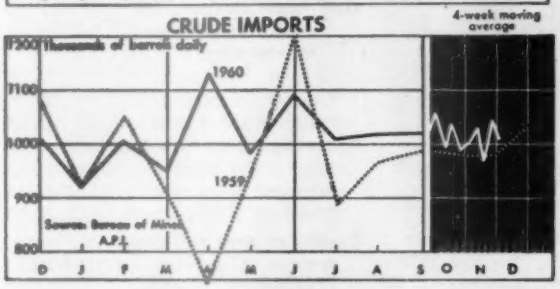
CRUDE-OIL PRODUCTION

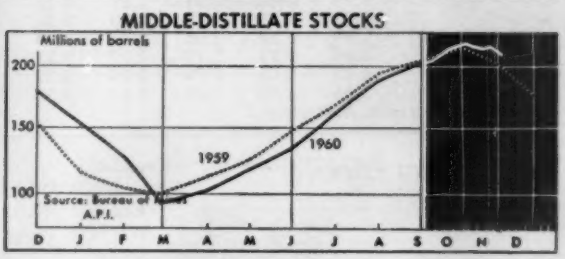


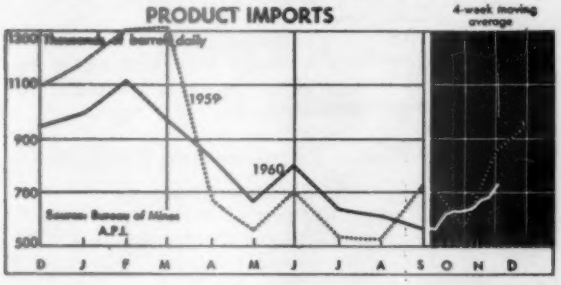

TOTAL DEMAND—ALL OILS
Millions of barrels daily
4-week moving average
1960
1959
Source: Bureau of Mines
O. & G. J.—A.P.I.
D J F M A M J J A S O N D

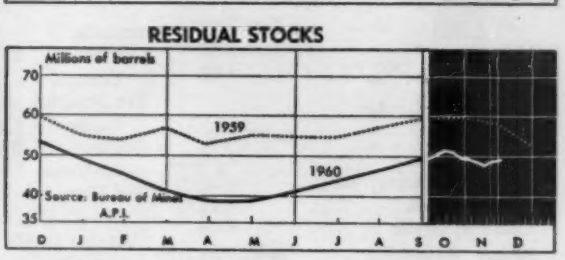












API REFINERY REPORT—DECEMBER 2, 1960
(Thousands of barrels)

District—	Daily avg. runs	Daily average production Gaso.*	Kero.	Dist.	Resid.	Stocks‡ Gaso.†	Kero.	Dist.	Resid.	Bureau of Mines, December 1959 Daily avg. runs	Daily average production Gaso.*	Kero.	Dist.	Resid.
East Coast	1,054	503.1	20.1	291.0	148.0	45,202	15,010	69,892	14,463	1,119	524.9	39.8	359.0	149.4
Appalachian:														
District 1	108	48.1	3.7	24.6	14.1	5,263	803	4,602	491	104	42.9	3.7	23.1	14.8
District 2	102	55.3	6.9	17.7	14.6	2,860	523	1,748	312	110	55.3	7.7	19.5	20.2
Ind., Ill., Ky.	1,432	799.3	70.7	328.3	192.2	29,970	7,450	30,112	6,790	1,548	798.6	82.6	359.4	231.7
Minn., Wis., Dak.	119	57.6	3.1	27.7	21.0	6,586	1,512	8,391	495	121	58.9	5.6	30.7	18.1
Okla., Kans., Mo.	710	422.8	12.9	186.7	23.4	15,990	1,534	14,266	944	699	381.5	15.5	199.5	26.1
Inland Texas	288	220.3	19.1	48.1	16.7	6,396	593	1,680	2,597	291	211.3	9.5	48.5	22.0
Texas Gulf Coast	1,884	954.3	157.8	463.9	127.5	25,468	3,818	15,908	5,410	1,877	980.1	117.9	460.1	154.5
La. Gulf Coast	633	359.3	63.4	158.0	43.0	10,583	2,454	6,095	1,445	714	363.0	87.0	163.5	47.5
N. La. and Ark.	111	65.4	4.9	23.9	8.7	5,699	1,228	2,816	147	101	46.7	6.7	23.5	8.1
Rocky Mountain:														
New Mexico	23	11.9	0.4	4.3	3.0	890	41	137	8	23	14.2	0.6	4.1	2.3
Other	272	138.4	4.7	66.4	29.1	5,601	417	2,916	1,186	293	141.9	3.9	69.6	34.4
West Coast	1,098	514.6	25.9	207.1	317.4	26,734	1,519	14,079	15,051	1,143	534.7	4.8	178.5	277.5
Dec. 2, 1960	7,834	4,150.4	393.6	1,847.7	958.7	187,242	36,902	172,642	49,339	8,143	4,154.0	385.3	1,939.0	1,006.6
Nov. 25, 1960	8,092	4,110.9	444.0	1,909.6	893.9	187,906	37,099	175,741	48,808	.....	.....	.....	.....	.....
Dec. 4, 1959	7,983	4,110.3	371.4	1,881.2	959.0	181,406	30,351	164,093	53,898	.....	.....	.....	.....	.....

*At refineries including natural blended. †Finished and unfinished. ‡At refineries, bulk terminals, in transit, and in pipelines.

Crude-Oil Prices

GRAVITY SCHEDULE

	Signal Hill, Calif.	Okla-homa	West Tex. (sour)	West Tex. (Inter.)	No.* Texas	Texas Refugio Light	Bayou Sale (La.)	Denver Jules-burg	Wyo. (sour)
14-14.9	$1.86	....	....	....	....	....	....	....	....
15-15.9	1.93	....	....	....	....	....	....	....	$1.81
16-16.9	2.00	....	....	....	....	....	....	....	1.86
17-17.9	2.06	....	....	....	....	....	....	....	1.91
18-18.9	2.13	....	....	....	....	....	....	....	1.96
19-19.9	2.20	....	....	....	....	....	....	....	2.01
20-20.9	2.27	$2.49	$2.35	$2.61	$2.29	$2.95	$2.90	$2.58	2.06
21-21.9	2.33	2.52	2.38	2.63	2.33	2.97	2.92	2.60	2.11
22-22.9	2.40	2.55	2.41	2.65	2.37	2.99	2.94	2.62	2.16
23-23.9	2.46	2.58	2.44	2.67	2.41	3.01	2.96	2.64	2.21
24-24.9	2.53	2.61	2.47	2.69	2.45	3.03	2.98	2.66	2.26
25-25.9	2.60	2.64	2.50	2.71	2.49	3.05	3.00	2.68	2.31
26-26.9	2.67	2.67	2.53	2.73	2.53	3.07	3.02	2.70	2.36
27-27.9	2.74	2.70	2.56	2.75	2.57	3.09	3.04	2.72	2.49
28-28.9	2.81	2.73	2.59	2.77	2.61	3.11	3.06	2.74	2.54
29-29.9	2.87	2.76	2.62	2.79	2.65	3.13	3.08	2.76	2.59
30-30.9	2.93	2.79	2.65	2.81	2.69	3.15	3.10	2.78	2.63
31-31.9	3.00	2.82	2.68	2.83	2.73	3.17	3.12	2.80	2.67
32-32.9	3.06	2.85	2.71	2.85	2.77	3.19	3.14	2.82	2.71
33-33.9	3.12	2.88	2.74	2.87	2.81	3.21	3.16	2.84	2.75
34-34.9	3.17	2.91	2.77	2.89	2.85	3.23	3.18	2.86	2.79
35-35.9	3.22	2.94	2.80	2.91	2.89	3.25	3.20	2.88	2.83
36-36.9	3.27	2.97	2.83	2.93	2.93	3.27	3.22	2.90	2.87
37-37.9	3.31	2.99	2.86	2.95	2.95	3.29	3.24	2.92	2.89
38-38.9	....	3.01	2.89	2.97	2.97	3.31	3.26	2.94	2.91
39-39.9	....	3.03	2.92	2.99	2.99	3.33	3.28	2.96	2.93
40-44.9	....	3.05	2.95	3.01	3.01	3.35	3.30	2.98	2.95

*Cooke, Grayson, Montague.

Flat Prices

Louisiana:
- Sweet Lake $3.00

Texas:
- East Texas 3.05-3.25
- Conroe 3.23-3.53
- Van 3.08

Pennsylvania Grade:
- Bradford $4.75-4.80
- Middle District 4.52
- Southwest Pennsylvania 4.25
- West Virginia 4.17
- Buckeye Grade 4.08

Illinois Basin **3.00-3.05**

Foreign

Middle East, Persian Gulf: (cargoes f.o.b. lifting port)
- Arabian, 34.0°-34.9°, Ras Tanura $1.80
- Iranian, 34.0°-34.9°, Bandar Mashur 1.78
- Iranian, 34.0°-34.9°, Abadan 1.73
- Iraq, 35.0-35.9°, Fao 1.72
- Kuwait, 31.0°-31.9°, Mina-al-Ahmadi 1.59
- Qatar, 41.0°-41.9°, Umm Said 1.95

Middle East, E. Mediterranean:
- Arabian, 34.0°-34.9°, Sidon $2.17
- Iraq, Mosul-Kirkuk, 35.0°-35.9°, Tripoli 2.19

Far East (cargoes, f.o.b. Lutong, Sarawak):
- Seria Light, 36° 2.42

Canada:
- Leduc-Woodbend $2.53
- Redwater (Alta.) 2.42
- Weyburn (light) 2.06
- Midale C 1.69

Venezuela:
- Cumbarebo, 47°-47.9°, Tucupido 3.34
- San Joaquin, 40°-40.9°, Puerto La Cruz 3.08
- Oficina, 35°-35.9°, Puerto La Cruz 2.80
- Tia Juana medium, 26°-26.9°, Amuay* 2.30
- Quiriquire, 16.0°-16.4°, Caripito 2.10
- Lagunillas heavy, flat, Las Piedras* 2.10
- Bachaquero, flat, 15°-16°, Las Piedras* 1.88

Prices for all crudes of 24° or lighter vary 2 cents per degree change, up or down. All crudes heavier than 24° vary 2.5 cents per half-degree gravity change.

*Also available at La Salina at 3 cents per barrel less.

Tanker Rates (Long Ton)

(Latest reported spot fixtures)

- ★ Gulf-NY, clean (ATRS+10%) $3.14
- ★ Gulf-NY, dirty (ATRS—5%) 2.71
- ★ Carib.-NY, dirty (ATRS—25%) 2.06
- ★ PG-UK, dirty (Scale—35%) (37s. 4d.) 5.24

★Denotes change from previous week.

Refined-Product Prices

Following quotations are realistic spot prices for refined products moving interstate on Wednesday each week. They may differ from refiners' posted prices and should not be considered as postings.

Light-product prices are in cents per gallon. Residual and crude prices are dollars per barrel. Crude prices are at the well unless otherwise listed.

Gasoline*

Mid-Continent (Group 3):
- Regular (91 octane) .. 12.25-12.50
- Premium (99 octane) . 15.00-15.25
- Natural gasoline (26-70) 4.5
- Breckenridge 4.0

Gulf Coast (cargoes for coastwise or export movements):
- Regular (90 octane) .. 11.00
- Regular (92 octane) .. 11.25
- Premium (98 octane) . 12.25

California (rack) Los Angeles:
- Regular (88 octane) .. 11.65-12.15
- Premium (94 octane) . 12.65-13.15
- Premium (100 octane) 14.00-14.65

Caribbean area (cargoes):
- Regular (87 octane) .. 10.125-10.25
- Premium (97 octane) . 11.75

*Quotations are for octanes shown. Prices usually vary with octane ratings within the regular, premium, and aviation grades.

Kerosine and Distillate

Mid-Continent (Group 3):
- Kerosine 42-44 ..... 10.375
- Diesel oil (58 d.i. and above) 10.00
- Distillate No. 1 ..... 10.00
- Distillate No. 2 ..... 9.00

Gulf Coast (cargoes):
- Kerosine 41-43 ..... 9.00- 9.25
- Distillate No. 2 ..... 8.25

New York Harbor (barges):
- Kerosine 41-43 ..... 10.05-10.15
- Distillate No. 2 ..... 9.05- 9-15
- Diesel fuel, 48-52 d.i. 9.35

Caribbean area (cargoes):
- Distillate No. 2 ..... 8.125

Residual Fuel (Bbl.)

Mid-Continent (Group 3):
- Residual fuel (max. 1% S) $1.90

Gulf Coast (cargoes):
- Bunker C fuel 2.30

New York Harbor (barges):
- Bunker C fuel 2.52

Caribbean (cargoes):
- Bunker C 2.10

California (rack):
- Bunker C fuel, Los Angeles 2.25

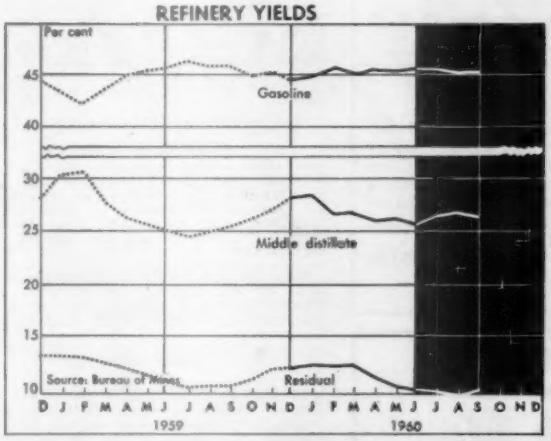
SUPPLY AND DEMAND—MAJOR PRODUCTS

(Thousands of barrels daily)

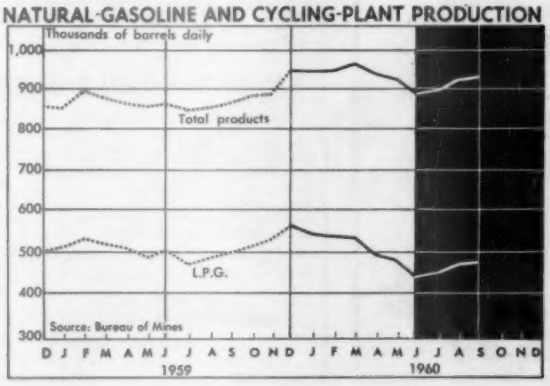
	Total demand	Refinery production	Stocks end of period†
GASOLINE			
November 1960*	4,065	4,030	187,150
October 1960*	4,190	4,015	185,400
September 1960	4,321	4,252	189,645
December 1959	4,044	8,143	187,115
November 1959	3,920	4,095	181,016
KEROSINE			
November 1960*	425	430	36,930
October 1960*	340	385	36,700
September 1960	296	359	35,408
December 1959	514	385	26,817
November 1959	393	333	30,701
DISTILLATE			
November 1960*	2,130	1,855	173,100
October 1960*	1,455	1,765	179,800
September 1960	1,339	1,831	168,235
December 1959	2,651	1,939	151,030
November 1959	2,225	1,835	171,114
RESIDUAL			
November 1960*	1,480	865	49,250
October 1960*	1,400	815	49,400
September 1960	1,290	859	50,136
December 1959	1,936	1,007	53,261
November 1959	1,716	972	58,587

*Preliminary. †Thousands of barrels.

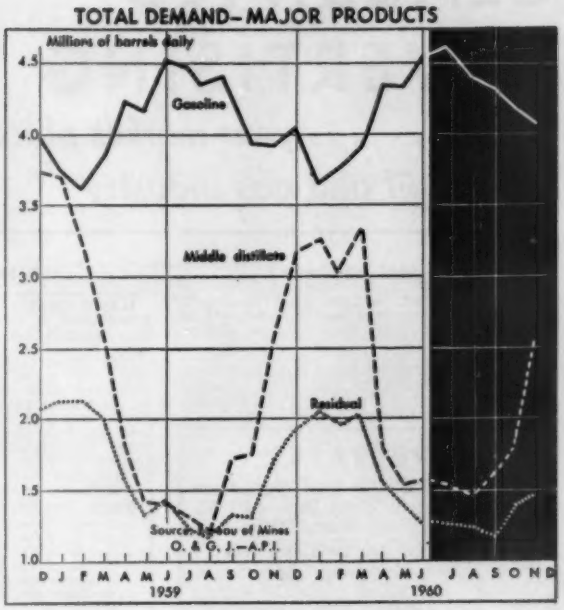
REFINERY YIELDS



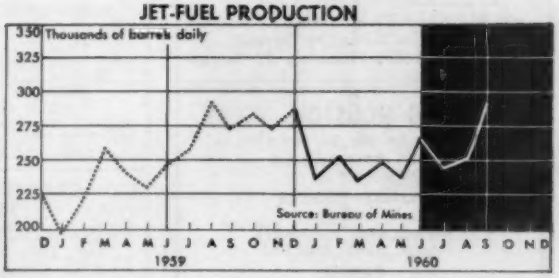
NATURAL-GASOLINE AND CYCLING-PLANT PRODUCTION



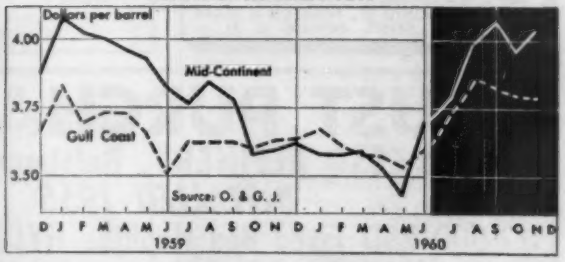
TOTAL DEMAND–MAJOR PRODUCTS



JET-FUEL PRODUCTION



REFINERY REALIZATION



REFINERY REALIZATION

	Nov.*	Oct.*	Sept.	Aug.
Mid-Continent	$4.07	$3.96	$4.04	$4.02
Gulf Coast	3.79	3.80	3.81	3.83

*Preliminary. Refinery realization is based on yields of major products and average spot prices of regular gasoline, kerosine, No. 2 fuel, and residual as published in The Oil and Gas Journal.

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Box M-166
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SITUATIONS WANTED

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⅛ WORKING INTEREST in six producing wells, one year old, in Southeast Kansas, in Chautauqua County. Must sell to settle estate. Call TW 2-8736 nights, or write: G. F. Shepherd, 840 Edson Drive, Beaumont, Texas.

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(Continued from page 173)

San Miguel County:
Southeast Lisbon. Pure Oil Co. 1 McIntyre Canyon unit, NE NW Lot 3, 5-44n-19w. IPF 3,450 M.c.f.d., 1-in. choke, TP 275 psi., SITP 2,100 psi. Mississippian 8,780-8,901 ft. TD 9,972 ft. Mississippian discovery, new field.

ILLINOIS

Edgar County:
Continental Oil Co. 11 W. I. Maddack "B", SE NE SE 2-12n-11w. IP 5 BOPD, 14 BWPD, Devonian 1,930-50 ft. TD 3,300 ft. Opens Elbridge pool.

McDonough County:
Gene Stoker 1 Fred Hanline, E½ SW NE 31-7n-3w. IP 4 BOPD, Silurian 519-28 ft. TD 540 ft. Opens Sciota pool.

NORTH LOUISIANA

Catahoula Parish:
Bodcaw Co. 111 Fee, C SE SE 16-7n-6e, 2⅜ miles southeast of Utility. IPP 15 BOPD, 23°, perf. 2,441-45 ft., Wilcox. TD 5,827 ft. New-field discovery 1½ miles southwest of Carr Lake discovery.

LaSalle Parish:
Justiss-Mears Oil Co., Inc., 1 A. L. Kuhn, 10-8n-2e. IP 104 BOPD (net). 10% b.s. and w., 10/64-in., 31°, TP 250 psi., perf. 2,691-95 ft., Wilcox. TD 3,003 ft. New pay in Searcy field.

SOUTH LOUISIANA

LaFourche Parish:
Texas Crude Oil Co. 1-A Waterford, 25-18s-20e. IP 110 BOPD, 6/64-in., 38.8°, GOR 879 cu. ft. per bbl., TP 1,875 psi., perf. 9,057-67 ft. and 9,070-78 ft. TD 10,047 ft. New oil pay in Bully Camp field.

MISSISSIPPI

Pike County:
Barnwell Drilling Co., Inc., 1 Barnwell-Fernwood, 30-3n-8e. IPP 130 BOPD (net), 42 BWPD, ½-in., 40.6°, GOR 300 cu. ft. per bbl., perf. 10,952-70 ft., lower Tuscaloosa. TD 11,015 ft. Discovery well of Southeast McComb field.

TEXAS GULF COAST

Lavaca County:
Robert Mosbacher 6 Gus Cranz, E. Farias Sur., A-170, 4 miles southeast of Ezzell. AOF 12,900 M.c.f.d., dry gas, shut-in 1,272 psi., perf. 3,427-29 ft., Frio. TD 4,207 ft. New pay in Southwest Speaks field.

WEST TEXAS

Dawson County:
Southern Union Gas Co. 1 Janie Pitts, 2 miles north of Ackerly in Sec. 46, Blk. 34, T-4-N, T&P Sur. IPF 271 BOPD, 16/64-in. choke, 38°, GOR 200:1. TP 250 psi. Dean 8,370 to 8,495 ft. TD 9,580 ft. PBTD 8,654 ft. New oil discovery.

Pecos County:
Paul L. Davis 1-A Pure Owens "A", 4 miles southeast of Bakersfield in Sec. 4, Blk. 604, GC&SF Sur. OWWO. IPP 33 BOPD, 24°, GOR 100:1, Yates open hole 1,637-1,732 ft. TD 2,150 ft. PBTD 1,732 ft. New oil discovery.

WYOMING

Sublette County:
McDonald Draw unit. Belco Petroleum Co. 1 Unit, NE SW 19-28n-112w. IPF 11,620 M.c.f.d., ⅝-in. choke, TP 609 psi. Wasatch Tertiary 3,000-35 ft. TD 3,545 ft. PBTD 3,505 ft. Wasatch discovery, new field in Green River basin.

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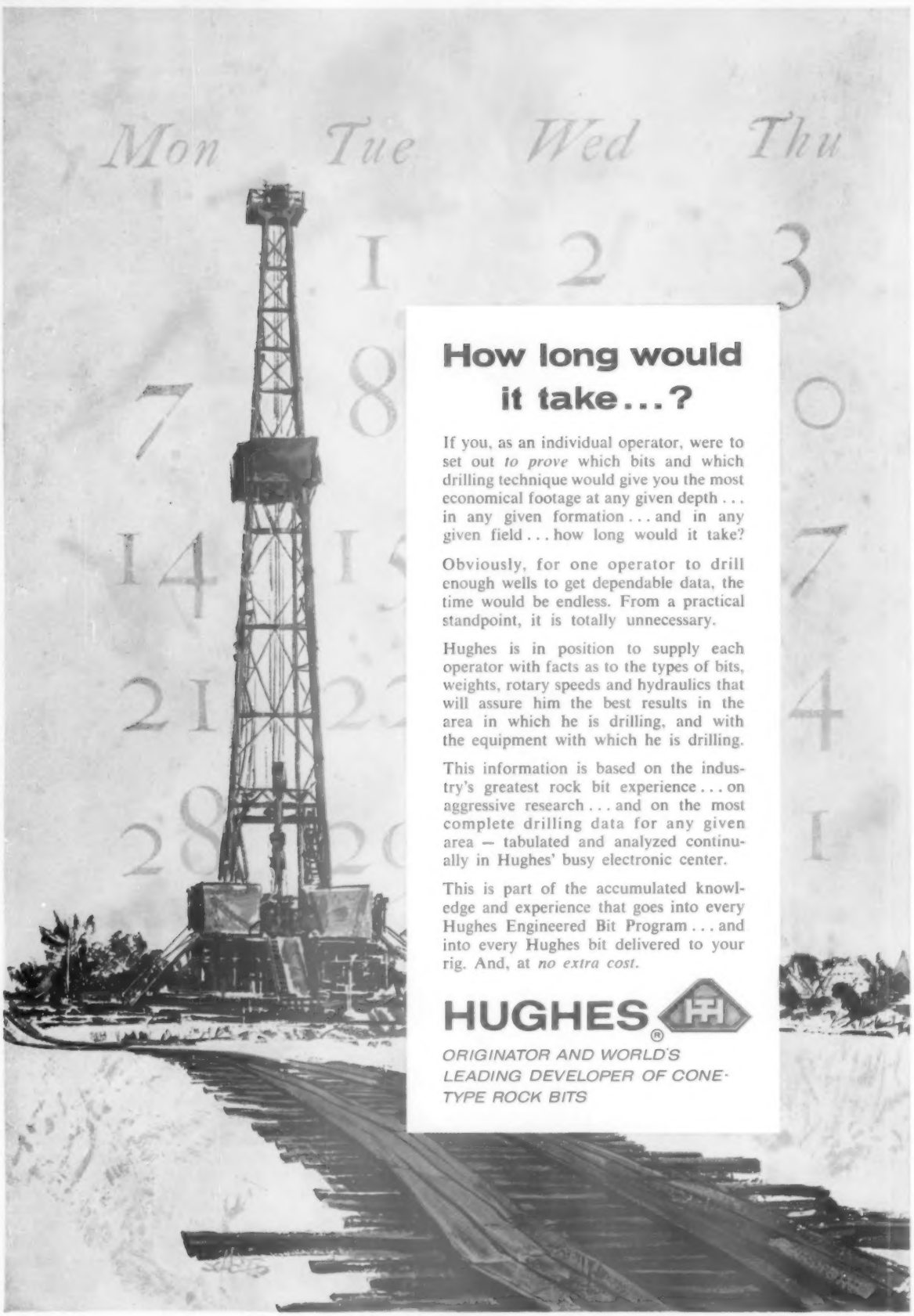

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